



THE 15TH QUANTITATIVE FINANCE CONFERENCE

SPEAKERS

Bruno Dupire: Head of Quantitative Research, Bloomberg L.P.

Jesper Andreasen (Kwant Daddy): Global Head Of Quantitative Research, Saxo Bank

Vladimir Piterbarg: MD, Head of Quantitative Analytics and Quantitative Development, NatWest Markets

Tony Guida: Executive Director – Senior Quant Research, RAM Active Investments

Rita Laura D'Ecclesia: Professor, Università degli Studi di Roma "La Sapienza"

Blanka Horvath: Honorary Lecturer, Department of Mathematics, Imperial College London

Helyette Geman, PhD, PhD: Professor of Mathematical Finance, Birkbeck – University of London & Johns Hopkins

Fabio Mercurio: Head of Quant Analytics, Bloomberg L.P.

Peter Jaeckel: Deputy Head of Quantitative Research, VTB Capital

Saeed Amen: Founder, Cuemacro

Francois Bergeaud: FRTB Lead Quantitative Analyst, BNP Paribas

Michael Pykhtin: Manager, Quantitative Risk, U.S. Federal Reserve Board

Brian Norsk Huges: Chief Quantitative Analyst, Danske Markets

Marc Henrard: Managing Partner muRisQ Advisory and Visiting Professor, University College London

Ignacio Ruiz: Founder & CEO, MoCaX Intelligence

Antoine Savine: Quantitative Research, Danske Bank

Alexandre Antonov, Chief Analyst, Danske Bank

Rebecca Declara: Interest Rates Options Trader, BayernLB

Andrei Lyashenko: Head of Market Risk and Pricing Models, Quantitative Risk Management (QRM), Inc.

Edvin Hopkins: Technical Consultant, NAG

Alexei Kondratyev: Managing Director, Head of Data Analytics, Standard Chartered Bank

Andrey Chirikhin: Founder, Quantitative Recipes

Icarus Gupta: Quantitative Analyst, BNP Paribas

Gilles Artaud: Head of Model Internal Audit, Group Crédit Agricole

Jos Gheerardyn: Co-Founder and CEO, Yields.io

Jörg Kienitz: Partner, Quaternion Risk Management

Christian Fries: Head of Model Development, DZ Bank

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OVERVIEW



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PRE-CONFERENCE WORKSHOP DAY WEDNESDAY 16TH OCTOBER:

1. The Future of LIBOR: Quantitative Perspective on Benchmarks, Overnight, Fallback and Regulation by Marc Henrard: Managing Partner muRisQ Advisory and Visiting Professor, University College London
2. Machine Learning for Option Pricing by Jörg Kienitz: Partner, Quaternion Risk Management

MAIN CONFERENCE STREAMS

THURSDAY 17TH OCTOBER - DAY ONE:

- Interest Rate Reform Stream
- Machine Learning & Quantum Computing Techniques Stream
- Volatility & Modelling Techniques Stream

FRIDAY 18TH OCTOBER - DAY TWO:

- XVA, AAD, MVA & Initial Margin Stream
- Machine Learning & Quantum Computing Techniques Stream
- Volatility & Modelling Techniques Stream

As always, delegates are not restricted to attend single streams on the main conference. You have the opportunity to hop around the different streams and attend the presentations that benefit you the most.

Stream presentation times will run concurrently with each other.

CONFERENCE LOCATION:

NH Collection Roma Giustiniano
Via Virgilio, 1 E/F/G
00193 Rome
Italy

Tel: +39 06 6828 1601

Website: <https://www.nh-collection.com/hotel/nh-collection-roma-giustiniano>

THE GALA DINNER IS COMPLIMENTARY FOR ALL CONFERENCE DELEGATES:

[Brillo Restaurant](#)

Groupe Valadier
Roma Via della Fontanella 12
00187 Rome
Italy

Tel: +39 06 324 3334

PRE-CONFERENCE WORKSHOP 1: WEDNESDAY 16TH OCTOBER

THE FUTURE OF LIBOR: QUANTITATIVE PERSPECTIVE ON BENCHMARKS, OVERNIGHT, FALLBACK AND REGULATION BY MARC HENRARD: MANAGING PARTNER muRisQ ADVISORY AND VISITING PROFESSOR, UNIVERSITY COLLEGE LONDON

WORKSHOP PRESENTER



Over the last 20 years, Marc has worked in various areas of quantitative finance. Marc's career includes Head of Quantitative Research at OpenGamma, Global Head of Interest Rate Modeling for Dexia Group, Head of Quantitative Research and Deputy Head of Interest Rate Trading at the Bank for International Settlements (BIS) and Deputy Head of Treasury Risk also at BIS.

Marc's research focuses on interest rate modeling and risk management. More recently he focused his attention to market infrastructure (CCP and bilateral margin, exchange traded product design, regulatory costs). He publishes on a regular basis in international finance journals, and is a frequent speaker at academic and practitioner conferences. He recently authored two books: *The multi-curve framework: foundation, evolution, implementation* and *Algorithmic Differentiation in Finance Explained*.

Marc holds a PhD in Mathematics from the University of Louvain, Belgium. He has been research scientist and university lecturer in Belgium, Italy, Chile and the United Kingdom.

WORKSHOP OUTLINE

With the increased expectation of some IBORs discontinuation and the increasing regulatory requirements related to benchmarks, a more robust fallback provision and a clear transition plan for benchmark-linked derivatives is becoming paramount for the interest rate market.

The recent regulations include the EU Benchmark Regulation (BMR) which may have a severe impact on the EUR market as early as January 2020. For all major currencies, new benchmarks have been proposed and the market are in a transition phase. Each transition has its idiosyncrasies and a common transition approach cannot be expected. We also describe the new products associated to the new benchmarks and the status in terms of liquidity for each market.

On the fallback side, several options have been proposed and ISDA held a consultation on some of them. The results of the ISDA consultation have been to select the "compounding setting in arrears" adjusted rate and the "historical mean/median" spread approach. We analyse the proposed options in details and present an alternative option supported by different working groups. The presentation focuses on the quantitative finance impacts for derivatives.

PRE-CONFERENCE WORKSHOP 1: WEDNESDAY 16TH OCTOBER

THE FUTURE OF LIBOR: QUANTITATIVE PERSPECTIVE ON BENCHMARKS, OVERNIGHT, FALLBACK AND REGULATION

DAY SCHEDULE: 09:00 – 17:30

BREAK: 10:30 – 10:45 / LUNCH: 12:30 – 13:30 / BREAK: 15:15 – 15:30

WORKSHOP AGENDA

Cash-collateral discounting.

- The standard collateral results and their exact application.
- What is hidden behind OIS discounting (and when it cannot be used)?
- Impact of new benchmarks on valuation

EU Benchmark regulation

The "alternative" benchmarks:

- SOFR, reformed SONIA, ESTER, SARON, TONAR.
- Secured v unsecured choice.
- What about term rates?
- Curve calibration
- SOFR and EFR: two overnight rates in one currency!

Status in different currencies. Cleared OTC products, liquidity. The different consultations in progress and what to expect from them. Fallback procedure

- ISDA consultation results
- The adjusted rate: compounding setting in arrears
- The adjustment spread: historical mean/median approach
- Quantitative issues with compounding setting in arrears
- Term rates: a credible alternative?
- Value transfer: transfers already incorporated and transfers to come

Clearing House doption

- Differences between bilateral and CCP rules
- EFR to SOFR transition in USD

Risk management of the fallback

- Delta risk through the transition
- Potential impacts on systems
- What a risk solution would look like
- Multi-curve: double or quit?
- Vanilla becoming exotics: cap/ floor and swaptions

New products associated to new benchmarks

- Volume and liquidity in the new benchmarks
- Futures on overnight benchmarks
- Deliverable swap futures

Detailed lecture notes for participants.

Some details will be adapted to the evolution of the market.

PRE-CONFERENCE WORKSHOP 2: WEDNESDAY 16TH OCTOBER

MACHINE LEARNING FOR OPTION PRICING BY JÖRG KIENITZ: PARTNER, QUATERNION RISK MANAGEMENT

WORKSHOP PRESENTER



Previously: Director FSI Assurance Deloitte GmbH and Co-Head of Quant Unit, Head of Quantitative Analytics, Dt. Postbank AG, Senior System Architect, Postbank Systems AG Financial Consultant, Reuters; Academic: Adj. Assoc. Prof. UCT, PD University of Wuppertal, PhD Math., Diploma Math. Books (Wiley): (A) Monte Carlo Frameworks in C++ (B) Financial Modelling – Theory, Implementation and Practice with Matlab Code, (Palgrave McMillan) (C) Interest Rate Derivatives Explained – Part I

WORKSHOP OUTLINE

The goal of this workshop is to provide a detailed overview of machine learning techniques applied for finance. We offer insights into the latest techniques of using such techniques for modelling financial markets where we focus on pricing and calibration.

We not only tackle the theory but give practical guidance and live demonstrations of the computational methods involved. After introducing the subject we cover Gaussian Process Regression and Artificial Neural Networks and show how such methods can be applied to solve option pricing problems, speed up the calculation of xVAs or apply them for hedging.

We further show how to use existing pricing libraries to interact with machine learning environments often set up in Python. To this end we consider the interaction with Excel, C++ (QuantLib/ORE) and Matlab.

We explain how to set up the methods in Matlab and Python using Keras, Tensorflow, SciKit and PyTorch by explaining the implementation on Matlab source code as well as Jupyter notebooks.

This workshop covers the fundamentals and illustrates the application of state-of-the-art machine learning applications in the financial markets. The examples used for illustration are given to the delegates after the course.

COURSE HIGHLIGHTS

This workshop covers the latest techniques for mastering the application of Gaussian Process Regression methods and Artificial Neural Networks techniques. We consider the theoretical underpinnings and give finance related examples in Matlab and/or Python.

WHAT WE'LL COVER

- Overview of some Machine Learning techniques
- Implementation and Examples
- Gaussian Process Regression for option pricing
- The maths of Neural Networks (with examples)
- Deep learning for pricing using the Heston and other SV models
- Deep learning for calibrating Stochastic Volatility Models

COURSE METHODOLOGY

- Presentation
- Examples (Matlab/Jupyter Notebooks)

PRE-CONFERENCE WORKSHOP 2: WEDNESDAY 16TH OCTOBER

MACHINE LEARNING FOR OPTION PRICING BY JÖRG KIENITZ: PARTNER, QUATERNION RISK MANAGEMENT

DAY SCHEDULE: 09:00 – 17:30

BREAK: 10:30 – 10:45 / LUNCH: 12:30 – 13:30 / BREAK: 15:15 – 15:30

WORKSHOP AGENDA

Machine Learning and Finance Overview

- Machine Learning
 - Supervised Learning for Classification, Regression
 - Unsupervised Learning
 - Selfsupervised Learning
 - Reinforcement Learning
- Finance
 - Pricing and hedging
 - Calibration
 - Simulation and exposure
 - Fraud detection

Machine Learning and Finance – Programming Overview

- ML and Financial Applications – an overview
 - Python, Tensorflow, Keras
 - C++, Java, Matlab, QuantLib/ORE
- Interfacing
 - Python – Excel
 - Python – QuantLib/ORE
 - Python – Matlab
- Some illustrations
 - Exposure for Bermudan Swaptions in Tensorflow
 - Hull-White with PDE in Python using QL
 - Monte Carlo Simulation in Tensorflow

Gaussian Process Regression (GPR)

- Intro to GPR and Regression
 - How does it work?
 - Train, Validate, Test
 - Covariance Functions
- Pricing Models and Methods
- GPR and Option Pricing (Heston, American Options,...)

Artificial Neural Networks in Finance – Introduction and examples I

- Intro to Artificial Neural Networks
 - Construction
 - ANN at work
- ANN math recap (with examples)
 - on Linear Algebra: Points, Vectors, Matrices, Tensors,...
 - on Optimization: Gradient Descent, ...
 - on Autodifferentiation
- Illustration: Learning a function
- It's only an approximation!
- Illustration:
 - Black-Scholes Merton Model
 - Heston Model
 - SABR Model
- Observations
- Preprocessing/Feature engineering
- Overfitting / Underfitting
- Train, Validate, Test
- Hyperparameters
- Different Types of Networks
 - FFNN – Feed Forward
 - CNN – Convolutional
 - RNN – Recursive
 - LSTM – Long Short Term Memory
 - GAN – General Adversarial
 - Autoencoders

Artificial Neural Networks in Finance – Introduction and examples II

- Calibration Basics
- Illustration: Deep Calibration
 - Heston Model
 - SABR Model
- Hedging Basics
- LSTM revisited
- Illustration: Deep Hedging
- (Time Series Analysis and Forecasting)

Matlab Code / Jupyter Notebooks are provided for this workshop

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

08:00 – 09:00 REGISTRATION AND MORNING WELCOME COFFEE

09:00 – 09:45 KEYNOTE - BRUNO DUPIRE: HEAD OF QUANTITATIVE RESEARCH, BLOOMBERG L.P.

THE PERILS OF PARAMETERIZATION

- Market-makers adopt parametric forms. How consistent is it?
- The geometry of arbitrage. Separating today from tomorrow's manifold
- The problem with recalibration. Arbitrage in Black-Scholes and Heston models
- Does the FX market know that high strike implied variance should never increase?

Abstract:

Automation, risk management and taste for Markov models lead markets to adopt parametric forms, for volatility for instance. It means that in the space of asset price vectors, the possible states at a future date lie on a low dimensional manifold that sometimes can be separated from the current price vector by a hyperplane, creating an arbitrage. We illustrate this principle with several situations (European type profiles, sticky strike assumption, term structure parameterization, recalibration issues with Black-Scholes, Heston and SABR models). We show that if every day the implied variance, defined as the square of implied volatility times the residual maturity, converges as strikes go to infinity (common assumption in FX options), this level can never go up. In the case of a market that uses a Black-Scholes model every day (flat volatility surface every day but its level may change from one day to the next), we construct explicitly a portfolio of options that gains in value whenever the volatility level has changed, at any time before the first maturity, for any spot price.

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

09:45 – 10:45 PANEL: MACHINE LEARNING, AI & QUANTUM COMPUTING IN QUANTITATIVE FINANCE

Moderator:

- **Bruno Dupire: Head of Quantitative Research, Bloomberg L.P.**

Panelists:

- **Tony Guida: Executive Director – Senior Quant Research, RAM Active Investments**
- **Alexei Kondratyev: Managing Director, Head of Data Analytics, Standard Chartered Bank**
- **Saeed Amen: Founder, Cuemacro**
- **Blanka Horvath: Honorary Lecturer, Department of Mathematics, Imperial College London**
- **Jos Gheerardyn: Co-Founder and CEO, Yields.io**

Topics:

- What is the current state of utilisation of machine learning in finance?
- What are the distinct features of machine learning problems in finance compared to other industries?
- What are the best practices to overcome these difficulties?
- What's the evolution of a team using machine learning in terms of day to day operations?
 - Are we becoming more software engineers than quants?
 - What is a typical front office 'Quant' skillset going to look like in three to five years time?
- How do we deal with model risk in machine learning case?
- How is machine learning expected to be regulated?
 - Is there a way to make it more explainable?
- Where do you think alternative data fits in with the vogue for machine learning?
 - Have you used alternative data?
 - Is it more for buy side or sell side.
- What applications can you list among its successes?
- How much value is it adding over and above the "classical" techniques such as linear regression, convex optimisation, etc.?
- Do you see high-performance computing (HPC) as a major enabler of machine learning?
- What advances in HPC have caused the most progress?
- What do you see as the most important machine learning techniques for the future?
- What are the main pitfalls of using Machine Learning currently in trading strategies?
- What new insights can Machine Learning offer into the analysis of financial time series?
- Discuss the potential of Deep Learning in algorithmic trading?
- Do you think machine learning and HPC will transform finance 5-10 years from now?
 - If so, how do you envisage this transformation?
 - Can you anticipate any pitfalls that we should watch out for.
- Discuss quantum computing in quant finance:
 - Breakthroughs
 - Applications
 - Future uses

10:45 – 11:15 MORNING BREAK AND NETWORKING OPPORTUNITIES

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

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STREAM CHAIR:

TONY GUIDA: EXECUTIVE DIRECTOR – SENIOR QUANT RESEARCH, RAM ACTIVE INVESTMENTS

.....
11:15 – 12:00

QUANTUM COMPUTING AND QUANTUM MACHINE LEARNING: QUANT FINANCE PERSPECTIVE

by Alexei Kondratyev: Managing Director, Head of Data Analytics, Standard Chartered Bank

- Gate model and analog quantum computing
- Quantum Neural Networks
- Boltzmann Machines and Born Machines

VOLATILITY & MODELLING TECHNIQUES STREAM

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STREAM CHAIR:

ALESSANDRO GNOATTO: PROFESSOR OF MATHEMATICAL FINANCE, UNIVERSITÀ DEGLI STUDI DI VERONA

.....
11:15 – 12:00

OPTIMAL INVESTMENT STRATEGY IN STOCHASTIC AND LOCAL VOLATILITY MODELS

by Vladimir Piterbarg: MD, Head of Quantitative Analytics and Quantitative Development at NatWest Markets

- We revisit the classical Merton optimal allocation problem
- We consider local and stochastic volatility models
- Significant corrections to the Merton ratio arise from hard to observe behaviour of the variance process around zero
- Adjustment to the myopic Merton ratio can be largely deduced from observed option prices
- Deep learning as an approach to determine model-free optimal investment strategy

INTEREST RATE REFORM STREAM

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STREAM CHAIR:

MARC HENRARD: MANAGING PARTNER muRisQ ADVISORY AND VISITING PROFESSOR, UNIVERSITY COLLEGE LONDON

.....
11:15 – 12:00

A QUANT PERSPECTIVE ON LIBOR FALLBACK

by Marc Henrard: Managing Partner muRisQ Advisory and Visiting Professor, University College London

- The current status on fallback
- Potential difficulties with the proposed options
- Value transfer in the fallback
- The RFR term rates

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

12:00 – 12:45

MACHINE LEARNING + CHEBYSHEV TECHNIQUES FOR RISK CALCULATIONS: BOOSTING EACH OTHER

by Mariano Zeron: Head of Research and Development, MoCaX Intelligence

The computation of risk metrics poses a huge computational challenge to banks. Many different techniques have been developed and implemented in the last few years to try and tackle the problem. We focus on Chebyshev tensors enhanced by machine learning, showing why they are such powerful pricing approximators in risk calculations. We show how the presented unique mix of techniques can be applied in different calculations.

We illustrate with Numerical results obtained in a tier-1 bank internal systems the computational gains these techniques bring to FRTB IMA

In particular, We will give special attention on how to side-step the curse of dimensionality and how machine learning techniques can be used to boost Chebyshev tensors.

VOLATILITY & MODELLING TECHNIQUES STREAM

12:00 – 12:45

PRICING COMMODITY SWING OPTIONS

by Andrea Pallavicini: Head of Equity, FX and Commodity Models, BANCA IMI

- Modelling futures with different delivery periods.
- Implying volatility smiles.
- Numerical investigations with swing option contracts.

INTEREST RATE REFORM STREAM

12:00 – 12:45

NEW INTEREST RATE BENCHMARKS: VALUATION AND RISK MANAGEMENT ISSUES

by Marco Bianchetti: Head of Fair Value Policy, Intesa Sanpaolo and Marco Scaringi: Quant Risk Analyst, Fair Value Policy Office, Intesa Sanpaolo

- Classic vs Modern Benchmark Rates: EONIA, ESTER, EURIBOR and co.
- Pricing and risk management with past, present and future interest rates
- Focus on XVAs
- Bye-Bye multi-curves?

Abstract

Once upon a time there was a classic financial world where all the interest rates were equal and considered a good proxy of the ideal risk-free rate required as basic building block of no-arbitrage pricing theory. In the present financial world after the credit crunch, multiple yield curves and volatility cubes are required to price financial instruments.

The current global reform of interest rate benchmarks is radically changing the scenario, adding more and more interest rates, with important consequences for pricing and risk management of financial instruments, but could also lead us back to a future financial world based again on a classic single-curve, few-volatility framework.

12:45 – 14:00 LUNCH

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

14:00 – 14:45

QUANTAMENTAL FACTOR INVESTING USING ALTERNATIVE DATA AND MACHINE LEARNING

by Arun Verma: Quantitative Research Solutions, Bloomberg, LP

Abstract

To gain an edge in the markets quantitative hedge fund managers require automated processing to quickly extract actionable information from unstructured and increasingly non-traditional sources of data. The nature of these "alternative data" sources presents challenges that are comfortably addressed through machine learning techniques. We illustrate use of AI and ML techniques that help extract derived signals that have significant alpha or risk premium and lead to profitable trading strategies.

This session will cover the following topics:

- The broad application of machine learning in finance
- Extracting sentiment from textual data such as news stories and social media content using machine learning algorithms
- Generated automated data driven insights/alerts for short term market prediction
- Construction of scoring models and factors from complex data sets such as supply chain graph, options (implied volatility skew, term structure), Geolocational datasets and ESG (Environmental, Social and Governance)
- Robust portfolio construction using multi-factor models by blending in factors derived from alternative data with the traditional factors such as fama-french five-factor model.

VOLATILITY & MODELLING TECHNIQUES STREAM

14:00 – 14:45

PAYOFF SCRIPTING LANGUAGES: SUNG AND UNSUNG GLORIES AND NEXT GENERATION

by Jesper Andreasen (Kwant Daddy): Global Head Of Quantitative Research, Saxo Bank

- Knowledge: There is (i). what you know, (ii). what you know you don't know, and (iii). what you don't know you don't know
- Scripting languages and exotic derivatives
- Scripting languages and XVA
- Scripting languages and AAD and regulatory capital
- Scripting languages and transactions, trade life cycle, back-office, and anti-money laundering

INTEREST RATE REFORM STREAM

14:00 – 14:45

LOOKING FORWARD TO BACKWARD-LOOKING RATES: A MODELING FRAMEWORK FOR TERMS RATES REPLACING LIBOR

by Fabio Mercurio: Head of Quant Analytics, Bloomberg L.P.

- A quick overview of the LIBOR transition
- Introducing the concept of extended zero coupon bond
- Defining and modeling in-arrears rates
- Modeling both forward-looking and backward-looking forward rates
- Modeling general forward-rate dynamics
- Introducing the generalized Forward Market Model (FMM)
- Differences between the FMM and the classic LMM
- The valuation of vanilla derivatives in the FMM
- Numerical examples

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

14:45 – 15:30

A LEAP OF FAITH? INTERPRETABILITY OF DEEP LEARNING MODELS FOR STOCK SELECTION

by Tony Guida: Executive Director – Senior Quant Research, RAM Active Investments

Over the last five years, Machine learning has become an intriguing yet interesting topic in quantitative investment. Amongst the numerous families and flavors of algorithms, Deep Learning stands as the one which is as fascinating as it is complex. However, the obsession from researchers for this topic is continuously increasing and results show promising territory for empirical asset pricing and stock selection purposes. Despite the significant promises of neural nets in finance, the pros of those algos seemed clouded and sometimes shadowed by the inherent complexity and the resulting lack of embedded transparency that they exhibit. Naturally, this lack of inherent “interpretability” led to the inflated “Machine Learning is a black box” myth, which turned to be a limit in the trust and then the adoption of those algos in production.

This presentation will review the following points

- Recap the basic notions of Machine learning and their related specificities for ML in finance
- Summarising what are the notions of explainability and interpretability in the field of deep learning models for stock selection.
- Introducing a taxonomy of methods for interpretability
- Equity US stocks universe use case to explain the different techniques and results for:
- Global & Local models
- Partial dependence
- Expanding the use case by focussing on two deep learning models for stock selection
- Multi-Layer Perceptron (MLP)
- Convolutional Neural nets (CNN)

VOLATILITY & MODELLING TECHNIQUES STREAM

14:45 – 15:30

A CRITICAL (RE-)VIEW ON INTEREST RATE MODELLING FOR PORTFOLIO SIMULATIONS, DERIVATIVE VALUATION, RISK MINIMIZATION, (DEEP) HEDGING AND ALM

by Christian Fries: Head of Model Development, DZ Bank and Peter Kohl-Landgraf, XVA Management, DZ Bank

Portfolio simulations and valuations (e.g., xVAs) require a high dimension risk factor simulation (“market simulation”, “world simulation”). Another area, where high dimensional risk factor simulations are required, are **hedge strategies** in general risk minimization problems (where “deep hedging” is an appealing method) and **ALM simulations**.

For such applications, interest rates are very often modelled with short rate models with low (Markov-)dimension (e.g., affine term structure models with or without stochastic volatility). In the context of xVA short rate models have seen a renaissance.

While this is mainly due to computational efficiency – reducing the amount of memory required to represent the interest rate curve (e.g. to just a few (or one) Markovian state variable) –, it comes as a surprise from a modelling perspective:

It is known that such low dimension models lead to unrealistic interest rate curve modelling and inappropriate risk management of complex derivatives (c.f. Piterbarg, Filipovic, F., etc. (at least 2003, 2007)).

Agenda:

- Motivation
 - Portfolio Simulations
 - Derivative Valuation
 - Bermudan Swaption Risk Management
- Interest Rate Modelling – a review
 - -HJM, Short Rate Models / Affine Term-Structure Models, Discrete Tenor Models
- Time-Homogenous Interest Rate Tenor Modelling
- A quasi Time-Homogenous Discrete Term Structure Model
- Open Source Reference Implementation
- Numerical Results

INTEREST RATE REFORM STREAM

14:45 – 15:30

LOOKING FORWARD TO BACKWARD-LOOKING RATES: COMPLETING THE FORWARD MARKET MODEL

by Andrei Lyashenko: Head of Market Risk and Pricing Models, Quantitative Risk Management (QRM), Inc.

- Generalized Forward Rate Model
- Building zero-bond price curve evolution
- Building local bank account process
- Local stochastic extension with HJM
- Local stochastic extension with Cheyette
- Implying short rate process
- Numerical examples

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

VOLATILITY & MODELLING TECHNIQUES STREAM

INTEREST RATE REFORM STREAM

15:30 – 16:00 AFTERNOON BREAK AND NETWORKING OPPORTUNITIES

16:00 – 16:45

MAKING PYTHON PARALLEL WITH LARGE DATASETS

by Saeed Amen: Founder, Cuemacro

Python is a great language for data science. When working with large datasets which don't fit entirely in memory, we may need to use some different approaches. In this talk we will discuss various Python libraries which are ideal for working with large time series datasets in a pandas-like way, including dask and vaex. We shall also explore how to make computation parallel in Python, talking about the differences between threading and multiprocessing, and wrappers like concurrent futures. We shall also talk about using the very powerful celery to distribute tasks. We shall illustrate the talk with a Jupyter notebook, including examples from finance (such as using FX tick datasets).

16:00 – 16:45

ON THE FORWARD SMILE

by Thomas Roos: Consulting Partner, Quantitative Financial

Abstract

Using short-time expansion techniques, we obtain analytic implied volatilities for European and forward starting options for a family of stochastic volatility models with arbitrary local volatility component and time dependent (piecewise constant) parameters. The formulas can be used to efficiently calibrate the model to European options at two expiries and to calculate the spanning forward starting option price.

16:00 – 16:45

IBOR TRANSITION AND LINKAGE TO THE RISK & CAPITAL FRAMEWORK

by Adolfo Montoro: Director, Global Head of Market Data Strategy & Analytics, Market Valuation Risk Management Deutsche Bank

MAIN CONFERENCE DAY ONE – THURSDAY 17TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

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16:45 – 17:30

DEEP LEARNING VOLATILITY

by Blanka Horvath: Honorary Lecturer, Department of Mathematics, Imperial College London

We present a consistent neural network based calibration method for a number of volatility models-including the rough volatility family-that performs the calibration task within a few milliseconds for the full implied volatility surface.

The aim of neural networks in this work is an off-line approximation of complex pricing functions, which are difficult to represent or time-consuming to evaluate by other means. We highlight how this perspective opens new horizons for quantitative modelling: The calibration bottleneck posed by a slow pricing of derivative contracts is lifted. This brings several model families (such as rough volatility models) within the scope of applicability in industry practice. As customary for machine learning, the form in which information from available data is extracted and stored is crucial for network performance. With this in mind we discuss how our approach addresses the usual challenges of machine learning solutions in a financial context (availability of training data, interpretability of results for regulators, control over generalisation errors). We present specific architectures for price approximation and calibration and optimize these with respect different objectives regarding accuracy, speed and robustness. We also find that including the intermediate step of learning pricing functions of (classical or rough) models before calibration significantly improves network performance compared to direct calibration to data.

VOLATILITY & MODELLING TECHNIQUES STREAM

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16:45 – 17:30

INDUSTRY-GRADE FUNCTION APPROXIMATION IN FINANCIAL APPLICATIONS

by Peter Jaeckel: Deputy Head of Quantitative Research, VTB Capital

- All maths has to be reduced to simple additions. Even multiplications.
- Simple methods: Taylor, Padé, Inverse Taylor, Householder
- Chebyshev, Economization, Chebyshev-Padé, Linear (Maehly) vs Nonlinear (Clenshaw-Lord)
- Remez, Remez I/II, and all that Voodoo
- The Russian source: Remez's weight function
- Taking the weight function into the problem: Remez II B
- Examples

INTEREST RATE REFORM STREAM

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16:45 – 17:30

PRACTICAL IMPLICATIONS FROM THE CHANGES TO €STR AND WHAT WILL HAPPEN TO EURIBOR

by Max Verheijen: Head of Financial Markets, Cardano

- Transitioning from EONIA to €STR
- Relevance of EONIA swaps for pension funds
- The switch to €STR discounting
- Transitioning from EURIBOR to €STR
- Most likely solution for an €STR term structure
- Implications for traded contracts

Max will discuss the practical implications of the IBOR and EONIA transition for interest rate risk hedgers like pension funds. What should we do with legacy swap portfolios and how do we transition to instruments with the new benchmarks?

.....
20:00 Gala Dinner. This is complimentary for all conference delegates.

[Brillo Restaurant](#)

MAIN CONFERENCE DAY TWO – FRIDAY 18TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

VOLATILITY & MODELLING TECHNIQUES STREAM

XVA, AAD, MVA & INITIAL MARGIN STREAM

08:30 – 09:00 MORNING WELCOME COFFEE

STREAM CHAIR:
JOS GHEERARDYN:
CO-FOUNDER AND CEO,
YIELDS.IO

STREAM CHAIRS:
HELYETTE GEMAN, PHD, PHD:
PROFESSOR OF MATHEMATICAL
FINANCE, BIRKBECK – UNIVERSITY OF
LONDON & JOHNS HOPKINS
AND
RITA LAURA D'ECCLESIA:
PROFESSOR, UNIVERSITÀ DEGLI STUDI
DI ROMA "LA SAPIENZA"

STREAM CHAIR:
IGNACIO RUIZ:
FOUNDER & CEO,
MoCaX INTELLIGENCE

09:00 – 09:45

QUANTIFYING MODEL UNCERTAINTY WITH ARTIFICIAL INTELLIGENCE

by Jos Gheerardyn: Co-Founder and CEO, Yields.io

- Defining model risk and model uncertainty
- Overview of relevant regulatory frameworks
- Measuring uncertainty with ML
- Model risk of AI

09:00 – 09:45

SMART DERIVATIVE CONTRACTS: RETHINKING OTC DERIVATIVES IN THE DIGITAL ERA

by Rebecca Declara: Interest Rates Options Trader, BayernLB

- Current state of bilateral and CCP-cleared derivatives
- Digital legal contracts
- Digitization of OTC derivatives – Redefining post-trade processes
- Technological aspects and requirements
- OTC derivatives in the digital era

09:00 – 09:45

APPLYING MACHINE LEARNING FOR TROUBLESHOOTING CVA EXPOSURE CALCULATION

by Shengyao Zhu: Senior Quantitative Analyst, XVA Trading Desk, Nordea

- Applying convolutional neural network to characterizing and troubleshooting CVA exposures used in XVA and Risk.
- How we choose the model specification to strike a balance between model performance and decision speed.
- Compare the model performance with human analyst.
- Possible extension for this model to other area like FRTB.

MAIN CONFERENCE DAY TWO – FRIDAY 18TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

09:45 – 10:30

ASYMPTOTICS CONTROL IN THE NEURAL NETWORK

by Alexandre Antonov: Chief Analyst, Danske Bank

- Kolmogorov-Arnold Theorem and asymptotics
- Control variate functions with the right asymptotics
- Neural networks with zero asymptotics
- Numerical experiments

A. Antonov and V. Piterberg

VOLATILITY & MODELLING TECHNIQUES STREAM

09:45 – 10:30

EFFICIENT NUMERICAL TECHNIQUES FOR PARAMETRIC PROBLEMS IN OPTION PRICING

by Kathrin Glau: Lecturer in Financial Mathematics, Queen Mary University of London

This talk presents some recent developments of efficient numerical techniques: The implied volatility is one of the most frequently used functions in finance. Its efficient computation for instance supports large-scale computations in machine learning algorithms to predict the volatility. In (Glau, Herold, Madan, and Pötz 2017) <https://arxiv.org/abs/1710.01797>, a new method to efficiently compute the implied volatility based on multivariate Chebyshev interpolation was introduced. We also show how further adaptations of the algorithm have lead to an even higher performance.

The method relies on polynomial interpolation. It is well-known that polynomial interpolation can be very efficient for low dimensional problems. Can we make polynomial interpolation also efficient for high dimensional problems?

To this end propose in (Glau, Kressner, Statti 2019) <https://arxiv.org/abs/1902.04367> a methodology combining low-rank tensor completion and Chebyshev interpolation.

XVA, AAD, MVA & INITIAL MARGIN STREAM

09:45 – 10:30

KVA UNDER IMM AND ADVANCED APPROACHES

by Justin Chan: Quantitative Strategy, Adaptiv, FIS

The two largest components of Capital Valuation Adjustment (KVA) are the costs of Counterparty Credit Risk (CCR) and CVA capital. For a bank using the most advanced capital models – Internal Models Method for CCR and the incoming SA-CVA capital – an accurate KVA involves forward simulating expected exposures (EE) over the lifetime of the portfolio – potentially a Monte Carlo in a Monte Carlo. We present a practical regression-based solution.

- Simulating EE: from regulatory stressed real-world measure to market implied measure
- A comparative study of regression vs brute force nested Monte Carlo
- SA-CVA: extending from simulating forward EE to simulating forward CVA sensitivities

10:30 – 11:00 MORNING BREAK AND NETWORKING OPPORTUNITIES

MAIN CONFERENCE DAY TWO – FRIDAY 18TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

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11:00 – 11:45

P PRICING BY Q LEARNING

by Andrey Chirikhin: Founder, Quantitative Recipes

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VOLATILITY & MODELLING TECHNIQUES STREAM

.....
11:00 – 11:45

FUTURES AND OPTIONS ON BITCOINS: A TENTATIVE ARBITRAGE APPROACH

by Helyette Geman, PhD, PhD: Professor of Mathematical Finance, Birkbeck – University of London & Johns Hopkins

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XVA, AAD, MVA & INITIAL MARGIN STREAM

.....
11:00 – 11:45

EFFICIENT CALCULATION TECHNIQUES FOR CREDIT EXPOSURE IN THE PRESENCE OF INITIAL MARGIN

by Michael Pykhtin: Manager, Quantitative Risk, U.S. Federal Reserve Board

- Modeling collateralized exposure
 - Producing exposure on a daily simulation time grid without daily revaluations or daily IM calculations
 - Reducing simulation noise in the presence of IM
 - Alternatives to calculating IM along simulation paths
-

MAIN CONFERENCE DAY TWO – FRIDAY 18TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

11:45 – 12:30

VALIDATING / AUDITING ML MODELS

by Gilles Artaud: Head of Model Internal Audit, Group Crédit Agricole

Machine Learning Models are like any other models, but different. You probably had presentation or experiences on how to use them in order to get good value out of their relative complexity.

This presentation will be about what, from a Model Audit point of view, should be set in place in order to avoid them failing despite all the efforts you put in building them.

But also incidentally how some can exploit their specific vulnerability to make them fail.

It will cover :

Model Risk : Machine Learning models are like any other model.

- So what's required for non-ML models?

Artificial Intelligence and ML : Machine Learning models are not exactly like any other model.

- **What** could make them fail?
- **How** could they fail?

Tricks or treats? Application to Neuron networks or Random Forest

VOLATILITY & MODELLING TECHNIQUES STREAM

11:45 – 12:30

DO DIAMONDS SHINE IN INVESTOR PORTFOLIOS

by Rita Laura D'Ecclesia: Professor, Università degli Studi di Roma "La Sapienza"

Diamonds are emerging as a new investment asset, providing great opportunities for trading, investing and diversification. Hedge funds and financial intermediaries have shown increased interest in the market and recent available data allow us to study its features and dynamics. The lack of a standardization system for the diamond commodity prevented the existence of an exchange regulated trading platform for diamonds which is being created and is starting to play an important role. Over the last decade trading diamonds has been advertised by banks and financial intermediaries as a hedge even if not enough evidence was provided. Diamond stocks have also been considered as a promising diversification asset for investors' portfolios (McKeough, 2015; Neil, 2014; Wilson and England, 2014; Cameron, 2014), though, to our best knowledge, neither academic scholars nor industry professionals have tested this hypothesis.

In this paper we test if diamonds represent an hedge or safe haven in the investment worlds and if diamond stocks represent an alternative to investing in diamonds. We address two practical investment questions: Can an investment in diamonds represent a hedge for an investment portfolio? Is diamond equity sensitive to diamond prices? We use Polished Prices data set to build a Diamond basket index (D'Ecclesia Jotanovic 2017) and the diamond mining stock prices traded at the main stock markets to investigate the safe haven or hedge hypothesis and to study the relationship existing between diamond prices and diamond stocks. Our results show that Diamonds can represent a hedge in investor's portfolios, however the market of diamond-mining stocks does not represent a valid investment alternative to the diamond commodity market.

XVA, AAD, MVA & INITIAL MARGIN STREAM

11:45 – 12:30

RUN-TIME AAD-COMPILER

by Dmitri Goloubentsev: Head of Automatic Adjoint Differentiation, MatLogica

Here, we present a new approach for Automatic Adjoint Differentiation with a special focus on computations where derivatives $dF(X)/dX$ are required for multiple instances of vectors X . In practice, the presented approach is able to calculate all the differentials faster than the primal (original) C++ program for $F()$ and achieve a major performance breakthrough in the AAD field. Our innovative idea is to use the Overloaded Operators to auto-generate AD-version of the primal function at run-time. The created AD-functions can be used for different $X[i]$ instead of performing classic OO AAD approach on each $F(X[i])$.

The produced functions have multiple advantages:

- Eliminating Operator Overloading overhead completely
- Full utilization of native CPU vectorization
- Segregating simulation data from quant library and enabling safe multi-thread simulations even if underlying program isn't multi-thread safe.

The [just-in-time AAD-Compiler](#) by [MatLogica](#) is a completely enabled OO AAD library build around this approach and offers the following features:

- Optimized machine binary code generation for both runtime performance and quick code generation
- Streaming compilation.
- Proprietary AD code-folding compression.
- Support for complete AVX2 and AVX512 vectorization

12:30 – 13:30 LUNCH

MAIN CONFERENCE DAY TWO – FRIDAY 18TH OCTOBER

MACHINE LEARNING & QUANTUM COMPUTING TECHNIQUES STREAM

13:30 – 15:00

EXTENDED TALK: DEEP ANALYTICS

by Antoine Savine: Quantitative Research, Danske Bank and Brian Norsk Høge: Chief Quantitative Analyst, Danske Markets

Abstract:

We apply deep learning to resolve the conundrum of revaluation of large, diverse trading books in the context of regulatory simulations and also offer a solution to MVA.

VOLATILITY & MODELLING TECHNIQUES STREAM

13:30 – 15:00

EXTENDED TALK: DEFAULT TIMING AND CORRELATION MODEL FOR DRC (FRTB INTERNAL MODEL)

by Francois Bergeaud: FRTB Lead Quantitative Analyst, BNP Paribas and Mirela Predescu: Deputy Head of Credit – Market and Counterparty Risk, BNP Paribas

Part 1: Default timing / Correlation model (F.Bergeaud)

- Calibrating market Asset and Default correlation
- Correlated default timing in structural model
- Hedging extreme losses

Part 2: Model risk in DRC: Choice of Copula (M.Predescu)

- Choice of Copula
- Copula Estimation
- Impact on DRC

XVA, AAD, MVA & INITIAL MARGIN STREAM

13:30 – 15:00

EXTENDED TALK: BALANCE SHEET XVA BY DEEP LEARNING AND GPU

by Stéphane Crépey: Univ Evry, France, and Rodney Hoskinson: ANZ Bank, Singapore

Abstract:

Two competing XVA paradigms are a semi-replication framework and a cost-of-capital, incomplete market approach. Burgard and Kjaer once dismissed an earlier incarnation of the Albanese and Crépey holistic, incomplete market XVA model as being elegant but difficult to solve explicitly. We show that the model (set on a forward/backward SDE formulation) is not only elegant, but also able to be solved efficiently using GPU computing combined with AI methods in a whole bank balance sheet context. We calculate the Mark-to-Market process cube (or its increment, in the context of trade incremental XVA computations) using GPU computing and the XVA process cube using Deep Learning (including joint ES and VaR) Regression methods.

15:00 – 15:15 AFTERNOON BREAK AND NETWORKING OPPORTUNITIES

15:15 – 16:00

CLOSING PRESENTATION:

NLP AND QUANT INVESTING: FINDING SIGNALS IN THE NOISE

Saeed Amen: Founder, Cuemacro

At its most basic, Natural Language Processing can be seen as a way for a computer to understand human language. Given that the vast majority of data comes in unstructured form, the potential opportunities for structuring, modeling and implementing text-based investment strategies are huge. For all those on the buy-side, understanding NLP – and the data, tools and processes needed to make it a success – is essential.

- How NLP has developed alongside the explosion of text-based content.
- Use-cases today for NLP within investment processes.
- Factors to consider when building NLP into a quantitative strategy

END OF CONFERENCE

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Both through regulation and industry practice, there is an increasing number of risk calculations that need to be done on a regular basis. These calculations require the valuation of portfolios on up to hundredths of thousands of scenarios making them computationally very expensive in time and cost.

MoCaX technology, based on Chebyshev Spectral Decomposition methods, is a methodology and software application which massively reduces the computational burden in a risk calculation. This is achieved by pricing the portfolio on very small number of pre-defined collection of points yielding an object capable of approximating a pricing function and its greeks to a very high degree of accuracy. The object can then be evaluated on thousands of risk scenarios in an ultra-efficient and numerically stable manner.

Several benefits are obtained with this technology. Applications include Market Risk VaR, IMA-FRTB, Dynamic Initial Margin for MVA and IMM, Exposure profiles for CVA and IMM, what-if analysis tools, etc.

mocaxintelligence.com | i.ruiz@iruiztechnologies.com



Matlogica specializes in software solutions that allow to accelerate Monte-Carlo Simulations using highly parallel vectorized software and automatic adjoint differentiation. At the moment we are developing a breakthrough C++ tool for AAD. Our unique approach allowed us to obtain impressive benchmarks compared to other well known AAD tools. If you are interested in getting the best performance from your existing or new C++ library, we can offer quick proof-of-concept projects to gauge the possible benefits our tool can bring to you.

Matlogica brings together a broad range of specialists: from quantitative analysts and computer science engineers to academic researchers. The company was organized around an invention which forms the kernel of the new Adjoint Differentiation Tool.

We specialize in parallel computations in a wide range of areas including XVA, MVA, Monte-Carlo Simulations, Derivative pricing and Risk, Large Portfolio simulations, Model calibrations such as Heston SV and LMM, among others.

matlogica.com



FIS Adaptiv provides solutions for enterprise-wide risk management solutions, spanning trade capture to operations management. Adaptiv Analytics is a state-of-the-art calculation engine that offers marketleading performance for market risk, counterparty credit risk, and regulatory calculations. AAD-enabled Analytics software is the latest exciting development from FIS Adaptiv. This will add to the suite of performant technologies upon which Analytics is built, which includes vectorization and GPU support, and will enable real-time calculation of exact XVA sensitivities for effective risk reporting, credit limit monitoring, and position management.

Through the depth and breadth of our solutions portfolio, global capabilities and domain expertise, FIS serves more than 20,000 clients in over 130 countries. Headquartered in Jacksonville, Fla., FIS employs more than 55,000 people worldwide and holds leadership positions in enterprise risk management, payment processing, financial software and banking solutions. Providing software, services and outsourcing of the technology that empowers the financial world, FIS is a Fortune 500 company and is a member of Standard & Poor's 500® Index.

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Yields.io is the first FinTech platform that uses AI for real-time model risk management on an enterprise-wide scale.

Our clients use our solution to speed up model validation tasks, to generate regulatory compliant documentation and to industrialize model monitoring. The platform works with all models that are used within the financial sector such as credit risk models, valuation algorithms, market risk, AML, AI and behavioural models.

Yields.io was founded by Jos Gheerardyn and Sébastien Viguié. The company is expanding quickly and has offices in Brussels and London. Yields.io has an international portfolio of clients with both investment banks as well as regional financial institutions.

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[Welcome to The Machine Learning Institute Certificate in Finance \(MLI\)](#)

Quantitative finance is moving into a new era. Traditional quant skills are no longer adequate to deal with the latest challenges in finance. The Machine Learning Institute Certificate offers candidates the chance to upgrade their skill set by combining academic rigour with practical industry insight.

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This course has been designed to empower individuals who work in or are seeking a career in machine learning in finance. Throughout our unique MLI programme, candidates work with hands-on assignments designed to illustrate the algorithms studied and to experience first-hand the practical challenges involved in the design and successful implementation of machine learning models. The MLI is a career-enhancing professional qualification, that can be taken worldwide.

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The Numerical Algorithms Group (NAG) are experts in numerical algorithms, software engineering and high-performance computing. They have served the finance industry with numerical software and consulting services for over four decades because of their outstanding product quality and technical support. Specifically, relevant to the finance industry, NAG pioneer in the provision of the NAG Library – numerical, machine learning and statistical components ideal for building Quant Libraries, Risk Applications and the like.

NAG also provides best-in-class C++ operator-overloading AD tools for CPU and GPU called dco (derivative computation through overloading) and dco/map (dco meta adjoint programming). The NAG Library and AD tools are used by many of the largest Investment Banks where they are embedded in Quant Libraries and XVA applications. As a not-for-profit company, NAG reinvests surpluses into the research and development of its products, services, staff and its collaborations.

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16TH / 17TH / 18TH OCTOBER 2019

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