A FINancial supervision and TECHnology compliance training programme

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement no. 825215 (topic ICT-35-2018, Type of action: CSA)The content reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

WP 3 – Artificial Intelligence Research

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- **O3.1. Establish** the **state of art** concerning artificial intelligence technology, its application in finance, the related main risk concerns and the existing risk management models;
- **O3.2. Improve risk management standards** for the application of artificial intelligence in finance by introducing risk management tools which will enable automatized compliance by fintech companies and increased efficiency of the supervisory activities.

➢ **developing new risk management standards** in FinTech, encouraging the **development of a European research innovation hub** that brings together universities, regulators and fintechs.

O3.1 Create, through individual research activity and the organisation of one dedicated workshop, common standards for risk management in artificial intelligence applications to finance, specifically for robo-advice consulting in asset management;

Workshop

European Commission

PROGRAM

First Fintech Workshop on AI, Financial Automation and Market Risk

Fin – Tech HO2020 project

UCL | FINTECH RISK MANAGEMENT www.fintech-ho2020.eu

19 May 2020
University College London

9.00	**Registration**
9.20	***Tomaso Aste (University College London)*** *Welcome*
9.30	***Wolfgang Karl Haerdle (Humboldt University of Berlin)*** *FRM@Europe: The Financial Risk Meter for European Assets*
10.00	***Ying Chen (National University of Singapore)*** *Topic Sentiment Asset Pricing with DNN Supervised Learning*
10.30	***Bihong Huang (Asian Development Bank)*** *Networking with Peers: Evidence from a P2P Lending Platform*
11.00	**Coffee break & Short talks** Michele Azzone (Polytechnic University of Milan): *Neural Network Middle-Term Probabilistic Forecasting of Daily Power Consumption* Jeremy Turiel (University College London): *Social media forecasting of COVID-19*
11.30	***Daniel Heller (University College London)*** *Digital money: the tension between technology and regulation*
12.00	***Sam Hastings (Financial Conduct Authority London)*** *Project Aegis: The Money Laundering Regulations*
12.30	***Javier Arroyo (Complutense University of Madrid)*** *Explainability of a Machine Learning Granting Scoring Model in Peer-to-Peer Lending*
13.00	**Lunch break & Short talks** Ernesto Troiano (GFT Italy): *Flagship Project for Digital Finance, potential collaboration with FIN-TECH* Fabian Placht & Max Guhl (T-Systems Germany): *Potential European cloud computing for the FIN-TECH, e.g. AI projects* Atta Badii (University of Reading): *IoT- & Blockchain-enabled Security Framework for New Generation Critical Cyber-physical Systems in Finance Sector*
14.00	***Paolo Giudici (University of Pavia)*** *Libra or Librae? Basket based stablecoins*
14.30	***Rapolas Lakavicius (European Commission)*** *EU Blockchain Strategy*
15.00	***Dror Kennett (FINRA)*** *Regulatory versus industry risk perspectives*
15.30	**Coffee break & Short talks** Bernardo Marques (University of Porto): *Using clustering ensemble to identify banking business models* Pier Francesco Procacci (University College London): *Market States and COVID-19*
16.00	***Jochen Papenbrock (Firamis)*** *XAI and Exploitation Strategy*
16.30	***Shatha Qamhieh Hashem (An Najah National University)*** *Option Price Forecasting using Multilayer Neural Networks*
17.00	***Victoria Thompson (Barclays)*** *The impact of AI and emerging technologies on the operation of Legal and Compliance functions of Financial Institutions*

Registration link here
Feedback link here

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- 11 invited speakers,
- 8 contributor speakers
- the entire advisory board
- 8 countries represented
- 12 institutions including Regulators and Industry
- 140 participants
- A cross-disciplinary forum

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Modelling Financial Systems

- Data Driven Modeling
- Network models and Network Filtering
- Cryptocurrency market
- Price and market states forecasting
- Novel risk meters
- Stable coin design
- Sentiment and prices

Design AI for finance and risk management

- Money laundering and crypto space
- Explainable AI
- Market states
- Financial automation
- Synthetic data generation
- P2P lending and banking automation

Automation in Risk Management, Investment and Forecasting

- Network approaches to portfolio
- Risk management automation with AI

Bias, Equality, Ethics

Machine driven and machine ruled markets

Risks from automation

Risks from criminally devised technology

New challenges in the Digital Finance and the Crypto Space: will technology help?

Publications (only the ones in the report under WP3)

1. T Aste. Cryptocurrency market structure: connecting emotions and economics, Digital Finance https://doi.org/10.1007/s42521-019-00008-9; arXiv preprint arXiv:1903.00472 (2019) (open access)
2. Giudici, P., Pagnottoni, P. (2019) High-frequency price change spillovers in bitcoin exchange markets. Risks 7, 111. (open access)
3. Giudici, Abu-Hashish (2020) Hidden A hidden Markov model to detect regime changes in crypto asset markets. Quality and Reliability Engineering International. https://doi.org/10.1002/qre.2673 (not open access)
4. Giudici, P., Polinesi, G. (2019) Crypto price discovery through correlation tworks. Annals of operations research. (not open access)
5. o Giudici, P., Pagnottoni, P., & Polinesi, G. (2020). Network models to enhance automated cryptocurrency portfolio management. Frontiers in Artificial Intelligence, 3, 22. (open access)
6. Bussmann Niklas, Giudici Paolo, Marinelli Dimitri, Papenbrock Jochen (2020). Explainable AI in Fintech Risk Management, Frontiers in Artificial Intelligence.
7. https://www.frontiersin.org/article/10.3389/frai.2020.00026 (open access)
8. Bussmann Niklas, Giudici Paolo, Marinelli Dimitri, Papenbrock Jochen (2020). Explainable machine learning in Credit Risk Management, Available at SSRN (open access), and under second revision in an international journal.
9. Mihoci,AndrijaandAlthof,MichaelandChen,CathyYi-HsuanandHärdle,WolfgangK.,FRM Financial Risk Meter (July 30, 2019). Advances in Econometrics, Volume 42, The Econometrics of Networks. Available at SSRN: https://ssrn.com/abstract=3429549 (open access)
10. Petukhina,AllaandTrimborn,SimonandHärdle,WolfgangK.andElendner,Hermann,Investing with Cryptocurrencies – evaluating their potential for portfolio allocation strategies (May 25, 2020). Available at SSRN: https://ssrn.com/abstract=3274193 or http://dx.doi.org/10.2139/ssrn.3274193 RR minor 20200325, Quantitative finance (open access)
11. Petukhina,AllaandSprünken,Erin,EvaluationofMulti-AssetInvestmentStrategieswithDigital Assets (2020). Available at:
12. SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3664219 RR major 20200331, Digital Finance. (open access)
13. Alla A. Petukhina, Raphael C. G. Reule & Wolfgang Karl Härdle (2020) Rise of the machines? Intraday high-frequency trading patterns of cryptocurrencies, The European Journal of Finance, DOI: 10.1080/1351847X.2020.1789684 (open access)
14. Burnie, A., Yilmaz, E., & Aste, T. (2020). Analysing Social Media Forums to Discover Potential Causes of Phasic Shifts in Cryptocurrency Price Series. Frontiers in Blockchain, 3, 1. (open access)
15. Schwendner, Peter; Schüle, Martin; Hillebrand, Martin, 2019. Sentiment analysis of European bonds 2016-2018. Frontiers in Artificial Intelligence. 2(20). (open access)
16. P. Giudici, R. Hochreiter, J. Osterrieder, J. Papenbrock, P. Schwendner, 2020, AI and Financial Technology. Editorial. Frontiers in Artificial Intelligence 2 (25). (open access)
17. Papenbrock, Jochen and Schwendner, Peter and Jaeger, Markus and Krügel, Stephan, Matrix Evolutions: Synthetic Correlations and Explainable Machine Learning for Constructing Robust Investment Portfolios (July 29, 2020) ssrn.com/abstract=3663220
18. Jaeger, Markus and Krügel, Stephan and Marinelli, Dimitri and Papenbrock, Jochen and Schwendner, Peter, Understanding Machine Learning for Diversified Portfolio Construction by Explainable AI (January 30, 2020). Available at SSRN: ssrn.com/abstract=3528616
19. Osterrieder, J. Kucharczyk, D. and Rudolf, S and Daniel Wittwer. 2020. Neural networks and arbitrage in the VIX. Digital Finance, 2, 97-115 (open access). https://link.springer.com/article/10.1007/s42521- 020-00026-y

USE CASES

I Network models to enhance automated cryptocurrency portfolio management (Pavia-UCL)

II Convergence and Divergence in European Bond Correlations (ZHAW)

III eXplainable AI in credit scoring and portfolio construction (Pavia)

Dissemination

1. SDA Smart Data Analytics Lecture Series, Guangzhou, 18.09.2019, Financial Risk Meter (FRM)
2. CENTRAL Workshop, Prague, LSTM Neural Network, 02.10.2019, Does tenure makes you Love
3. your Job
4. FinTech & RegTech Fundamentals, Techs and Apps, Taiwan, 20.02.2020, Financial Risk Meter for Asia
5. May 2019 Joint Spring Conference – Systemic Risk and the Macroeconomy, Deutsche Bundesbank – ECB, Frankfurt, Germany
6. July 2019 RTG Summer Camp, Buckow, Germany
7. July 2019 XMU-HUB Partnership Conference, Oberbarnim, Germany
8. August 2019, Singapore Economic Review conference 2019, Singapore
9. August 2019, The 4th Berlin-Princeton-Singapore Workshop on Quantitative Finance, Singapore
10. September 2019, Conference Stat of ML, Prague Czech Republic
11. November 2019 Foundations of Modern Statistics Conference, Berlin, Germany
12. December 2019 Cryptocurrencies Data, Statistics, Finance The First Yushan Conference Workshop in NCTU, Hsinchu, Taiwan
13. Poster presentation on Sector neutral portfolios at Netsci 2019, Burlinghton, Vermount USA (https://vermontcomplexsystems.org/events/netsci/) 27-31 May
14. Complex Networks 2019 December 10-12, 2019-Lisbon, Portugal (https://www.com- plexnetworks.org/)-presentation on sector neutral portfolios, won award for best presentation.
15. Meeting on 1 February in Brussels, International Association for Trusted Blockchain Applications (INATBA).
16. UK HM Treasury Consultation on the transposition of the Fifth Anti-Money
17. Laundering Directive (5AMLD): regulation of cryptoasset, participation national consultation, 2019.
18. International Organisation for Standardisation (ISO)
19. Conference in Dublin, 27-31 May
20. Conference in Hyderabad, 18-22 November
21. Development of Vocabulary (ISO/DIS 22739) for international standard on Blockchain and Distributed Ledger Technology
22. Development of Reference Architecture (ISO/CD 23257) for Distributed Ledger Technology
23. Development of technical specification on Blockchain and Distributed Ledger Technology-Reference Architecture (ISO/WD TS 23258).
24. Participation to All-Party Parliamentary Groups (UK)
25. Leaders of Subcommittee on the Future of Payments, Whitechapel Think Tank
26. Invited talk Smartex workshops Payment Systems, 10 September
27. Invited talk Smartex workshops Identity, 15 October
28. Poster Presentation at Future of DLT workshop, Isaac Newton Institute, Cambridge, 6 November.
29. Invited talk, 28 January at Centre for Business Innovation (based in Cambridge)
30. Invited Talk and Debate on Identity at Oxford Prospects Programme, Oxford, 31 October.
31. Invited Talk, SIBOS London, sponsored by NTT DATA, 24 September.
32. Invited Keynote Presentation at Blockchain Turkey-Istanbul, 24 October.
33. Participation in Rustat Conference on Blockchain and Distributed Ledger Technology, Jesus College, Cambridge, 13 June
34. Presentation by Jeremy Turiel at the AI and Data Science in Trading conference - June 22, 2020, 13:00- 14:00, AI
35. Jörg Osterrieder, April 2, COST Mathematics for Industry Conference, Bath, UK.
36. Jörg Osterrieder, The Third International Conference on Mathematics and Statistics AUS-ICMS ‘20
37. February 6-9, 2020, American University of Sharjah.
38. Jörg Osterrieder, 2nd Berlin Conference, Crypto-Currencies in a Digital Economy, November 29/30, Berlin, Germany.
39. Schwendner, Peter, "Convergence and Divergence in European Bond Correlations" at "4th RegTech Workshop on AI in Finance", WU Vienna, February 26, 2020.
40. Schwendner, Peter, "Current European sovereign bond dynamics", Centre for Financial Markets (CFM) Research Seminar, Michael Smurfit Graduate Business School, University College Dublin, October 31, 2019.
41. Schwendner, Peter, "Current European bond market dynamics" at "Zurich Volatility Investing", Zurich, October 24, 2019.
42. Schwendner, Peter, "Convergence and Divergence in European Sovereign Bonds" at "1st European Workshop on ML-Based Solutions in Finance", Winterthur, September 4, 2019.
43. Schwendner, Peter, "Financial Application of Network Analysis" at "Big Data Analytics Knowledge Exchange Platform", Horizon 2020 FIN-TECH project, Copenhagen, August 26, 2019
44. Schwendner, Peter, "Correlation Influence Networks for Sentiment Analysis in European Sovereign Bonds" at Financial Revolution-Sentiment Analysis, AI and Machine Learning, London, June 25, 2019.
45. Schwendner, Peter, "European Sovereign Bond Network Dynamics", Humboldt-University Berlin, April 18, 2019.
46. Schwendner, Peter, "Active risk-taking in investment management", International Week, ISCTE Business School Lisbon, April 1-4, 2019.
47. Jörg Osterrieder, Schwendner Peter, Branka Hadji Misheva, Special SupTech, ZHAW, 31st January 2020.
48. "Convergence and Divergence in European Bond Correlations" at "4th RegTech Workshop on AI in Finance", WU Vienna, February 26, 2020.
49. "Current European sovereign bond dynamics", Centre for Financial Markets (CFM) Research Seminar, Michael Smurfit Graduate Business School, University College Dublin, October 31, 2019.
50. "Current European bond market dynamics" at "Zurich Volatility Investing", Zurich, October 24, 2019. o "Convergence and Divergence in European Sovereign Bonds" at "1st European Workshop on ML-
51. Based Solutions in Finance", Winterthur, September 4, 2019.
52. "Financial Application of Network Analysis" at "Big Data Analytics Knowledge Exchange Platform", Horizon 2020 FIN-TECH project, Copenhagen, August 26, 2019.
53. "Correlation Influence Networks for Sentiment Analysis in European Sovereign Bonds" at Financial Revolution-Sentiment Analysis, AI and Machine Learning, London, June 25, 2019.
54. "European Sovereign Bond Network Dynamics", Humboldt-University Berlin, April 18, 2019.
55. 26th of November 2019, XAI-presentation at FIRAMIS special workshop for bankers & insurers I BDA and AI in Brussels
56. 6th of December 2019, XAI-presentation at EIOPA InsurTech Task Force in Frankfurt
57. 11th of December 2019, representing FIN-TECH project at EU Fintech Lab in Brussels
58. in 2019 joining two meetings at EC in Brussels
59. Please also have a look at our WP6 RegTech and WP7 Dissemination related to our XAI activities. Firamis helped to organize and supported the workshops of other FIN-TECH project partners:
60. SupTech workshop BDA of the ZHAW in Budapest (15th-16th of May 2019)
61. SupTech workshop BDA of the Bundesbank in Frankfurt (26th-27th of June 2019)

Impact: involvement of regulators

Meetings with FCA

- UK Financial Conduct Authority Consultation on Cryptoassets, participation in national consultation, 2019
- 27 February 2019 contribution to Cryptoassets Roundtable at FCA
- May 16, 2019-1/2 day-Participation of FCA members at BARAC meeting on Technology in Finance,
- Law and Regulation, http://www.systemicrisk.ac.uk/TechBARAC.
- Sept 11, 2019-1/2 day-Participation of FCA members at BARAC meeting on Blockchain ad distributed systems for the digital economy

SupTech Activities

1) Discussion and preparation work - 16 January 2019 10:00-13:00,
2) Discussion and preparation work - 12 February 10:00-13:00
3) Regulation and FinTech - Financial Conduct Authority - London - 05/03/2019
4) Data Analytics: Machine Learning in Financial Systems, a P2P lending use case - Financial Conduct Authority - London - 03/04/2019 (moved from 6/03/2019)
5) Presentation / training by Tomaso Aste at the FCA innovate away day on “Future of AI” -September 17th, 2019, 10:00-13:00, AI.
6) **Workshop AI, Financial Automation and Market Risk, - London - 19/05/2020 9-18**

Impact: engagements with industry & government

Government, UK

Bank of England
Financial Conduct Authority
HM Revenue and Customs
Metropolitan Police
Government Digital Service (GDS)
Digital Catapult
Ordnance Survey
City of London Corporation
Department for International Development (DFID)
Department for Business, Energy, and Industrial Strategy

Government International

Bermuda Monetary Authority
Abu Dhabi Global Market
Cyprus Securities and Exchange Commission
Bank of Canada
Federal Reserve Bank (Cleveland, US)
De Nederlandsche Bank

Industry

British Standardisation Institution (BSI)
Bank for International Settlements (BIS)
Fidelity Investments
British Telecom
Banco Santander
R3
Barclays
Royal Bank of Scotland
HSBC
Deutsche Bank
Credit Suisse
Accenture
Ernst & Young
KPMG
Willis Towers Watson
Samsung
SFE Consulting
Baker McKensie
Womble Bond Dickinson
Eversheds Sutherland
TISA
IHS Markit
Pacific Point Partners
Wychwood Consulting Ltd
Consensys
Ledgerblocks
EngineB
NextID
CodeReg
Vontobel
Flint Global
Electron
Electic Consulting
Bequant
YOTI
IDWorks
Publiq.network
Hello Hub
Unblocked Events
Koine Finance
ObjectTech Group (defunct)
Blockpass
Exactpro Systems
Trakti
Outlier Ventures
Tabbre
2030
Qadre
Qredo
Vermeg

- developing new risk management standards in FinTech, encouraging the development of a European research innovation hub that brings together universities, regulators and fintechs.

Feedback

The feedback of all our initiatives has been extremely positive. There is a real appetite for this kind of initiative and an absolute need.

Much more can be done (and will be done)