Outcoder

Ready To
Prove
Your Worth
In The Fields Of
AI AND FINANCE

Compete among the top universities in Europe in an AI challenge!

Genhack AI Challenge Kick-Off

Wednesday, October 20th

Agenda

- **5pm: Welcome and presentation of the Genhack competition!**

Presented by: Luca Zanna and Jean-Marc Marty, cofounders of Outcoder.ai.

- **5:15pm: Generative Models: A Scientific Approach**

Presented by: Professor Eric Moulines, Professor at Ecole Polytechnique and Member of the Académie des Sciences.

- **5:30pm: A Quick Overview of AI at BNP Paribas**
- Presented by: Léa Deleris, Head of RISK Artificial Intelligence Research at BNP Paribas

- **5:45pm: Questions & Answers**
- **6pm: Speed Meetings – Special Q&A**
- **6:30pm: End of Kick-Off**

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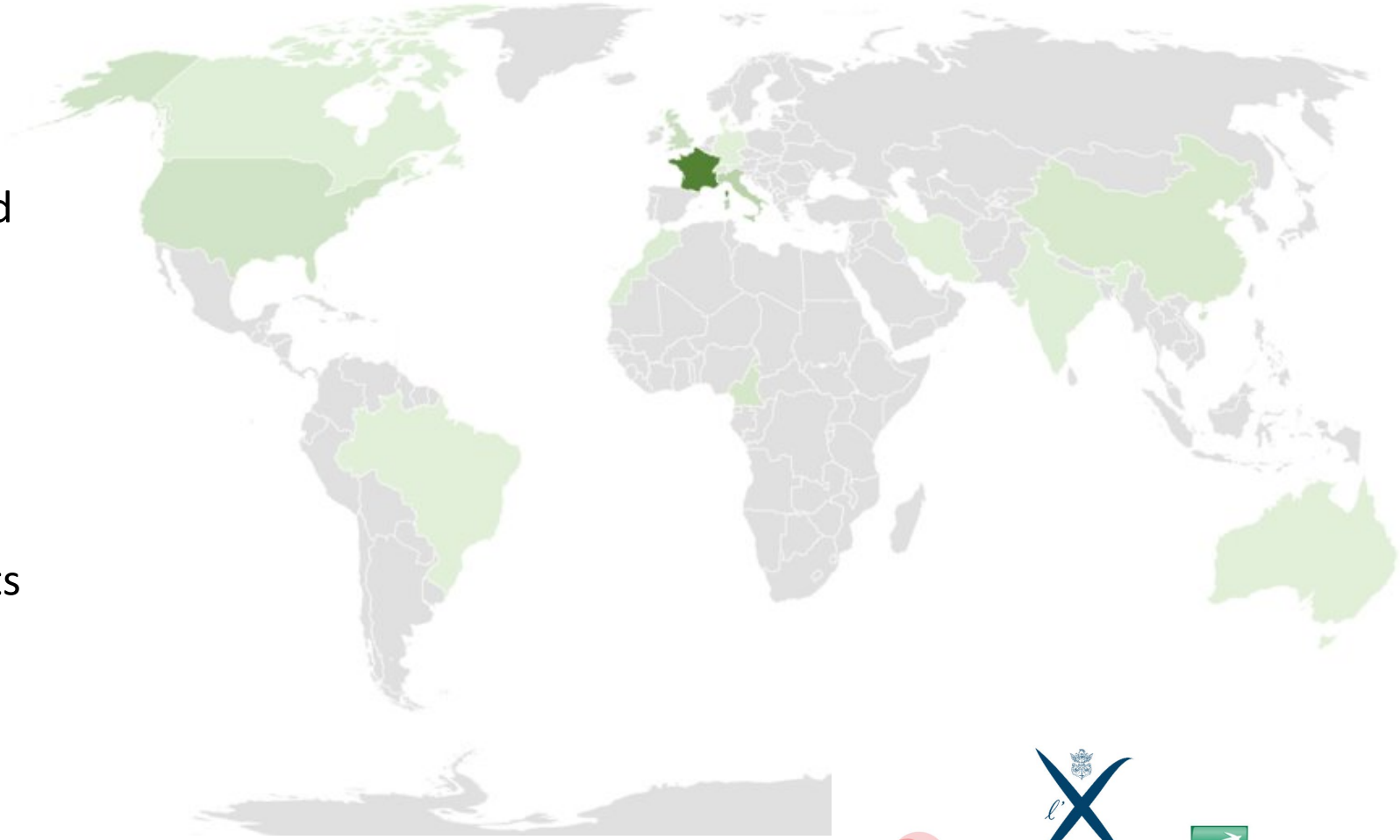
Welcome to the GenHack AI Competition!

What is the Genhack AI competition?

- 295 participants ! 🎓
  two thirds in Europe, one third outside Europe
- 15 countries
- 66 universities
- Several guilds with participants from different schools and different continents



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Guilds

- 5 Layers of Stonks
- 3neurons
- Kurama D Team
- GuldoGuild
- Invicta Quant
- $e^{i\pi}+1=0$ 1st Place
- Prsim 2.0
- Geek Guild
- Winx
- War Brother's
- MARS
- SRSD-MathEng
- The Circus
- La Casa De Vinci
- FinDogz
- aGENcy
- Naruto😀, Sasuke😭 et Sakura 💁‍♀️
- NIA
- The Battle-Borns
- ECES
- Terran
- DL Manjikai
- ImMF
- Pachikaa
- Strawberry Inc.
- Gen Pentagon
- FinPred
- W.E.S.H.
- The Frenzy Generators
- NoName Guild
- Random Guild
- Lbitrik

If you do not have a guild yet, use the **speed meetings at 6pm** to find guild members!

You need a guild to compete. **Deadline for creating a guild is Saturday, October 23.**

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Organisers

Outcoder

Luca Zanna
Co-founder

Jean-Marc Marty
Co-founder

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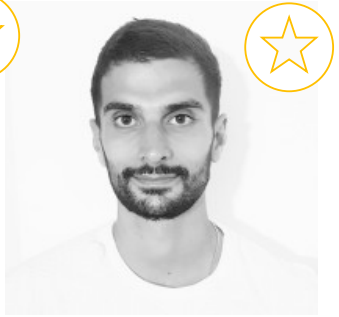
Eric Moulines
Professor

Emmanuel Gobet
Professor

Marine Saux
Project Manager



Michaël Allouche
PhD

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Léa Deleris
Head of RISK
AI Research

Antoine Bezat
Head of Stress
Testing Methodologies
and Models

Dorinel Bastide
Senior Quantitative
Analyst

Wilson Ramos
Quant/ Data Scientist

Jean-Philippe Lemor
Head of Systematic Strategies
and Hybrid Quantitative Research

Coach

Competition

Context

In the last two decades, the increasing number of shocks and financial crises has been a major issue for the financial risk management teams.

Among the wide range of exercises in this field, Stress tests have become a main guideline for the regulator in order to assess the banking system resilience against the realizations of various categories of risk (market, credit, operational, climate, etc). The main challenge is to simulate unfavorable extreme (but plausible) negative returns similar to a historical dataset.

The Task

This is an unsupervised learning problem: **Given real data from stock market indexes that will act as a train dataset, the task is to learn a generative model that simulates synthetic stock market indexes.**

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Competition Agenda

Monday, October 25th: Start of the competition!
You will receive a training set. The training set is a matrix with 746 rows and 4 columns.
The rows are the log-return on a given day, while the columns are four stock market indices.
There is not a lot of data, so one of the challenges is related to size of data.

First submission (not included in final ranking)
By Saturday, October 30th: You will submit your generated log-returns. You should generate 410 rows of data.
On Tuesday, November 2nd: Publication of the guild scoreboard, scored against the validation set.

Second submission (1/3 of final ranking)
By Saturday, November 6th: You will submit your generated log-returns. You should generate 410 rows of data.
On Tuesday, November 9th: Publication of the guild scoreboard, scored against the validation set.
The validation set is shared with everybody

Third submission (2/3 of final ranking)
By Saturday, November 20th: You will submit your generated log-returns. You should generate 408 rows of data.
On Thursday, November 25th: Publication of the guild scoreboard, scored against the test set.

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How to submit the generated data?

You will submit a Zip file from the Outcoder website.

The name should include the Guild name and the date.

The zip file should contain:

- Data.csv => a .csv file with the generated data
- Noise.csv => the associated input noise used in the model to generate data
- Python code => the inference code for loading the model and for simulating the data
- CSV or binary => the model parameters

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Submissions Evaluation

Guilds are judged based on two evaluation score metrics:

▷ **Marginals - Anderson-Darling** The Anderson-Darling distance (see [1], [2] for more details) computes a weighted square difference between the hypothetical cumulative distribution function (c.d.f) F from which samples have been drawn, and the empirical c.d.f $\widehat{F}_n$ based on n observations:

$$W_n = n \int_{-\infty}^{\infty} \frac{\left(\widehat{F}_n(x) - F(x)\right)^2}{F(x)(1-F(x))} dF(x).$$

For this challenge, let $\widehat{F}_n^\tau$ be the empirical distribution function associated to $X_1^\tau, ..., X_n^\tau$ and let $X_{1,n}^\tau \leq \cdots \leq X_{n,n}^\tau$ be the order statistics for each financial ticker $\tau = 1, \ldots, d$. We denote $\widetilde{u}_{i,n}^\tau$ the model probability of a generated variable $\widetilde{X} = G(Z)$ for a specific ticker τ such that

$$\widetilde{u}_{i,n}^\tau = \frac{1}{n+2}\left(\sum_{j=1}^{n} \mathbb{1}\left\{X_j^\tau \leq \tilde{X}_{i,n}^\tau\right\} + 1\right).$$

The Anderson-Darling distance for each ticker τ can be computed as

$$W_n^\tau = -n - \frac{1}{n}\sum_{i=1}^{n}(2i-1)\left(\log(\widetilde{u}_{i,n}^\tau) + \log(1 - \widetilde{u}_{n-i+1,n}^\tau)\right). \tag{1}$$

Then, the global metric on the marginals is just the average distance for all tickers and is computed as

$$\mathcal{L}_M = \frac{1}{d}\sum_{\tau=1}^{d} W_n^\tau.$$

▷ **Dependence - Absolute Kendall error** Kendall's dependence function (see [3] for more details) characterizes the dependence structure associated with a copula C and is the univariate cumulative distribution function defined by $K_C(t) = \mathbb{P}\left(C\left(U^{(1)}, \ldots, U^{(d)}\right) \leq t\right)$ for all $t \in [0,1]$ and $\left(U^{(1)}, \ldots, U^{(d)}\right)$ a random vector with uniform margins on $[0,1]$. The estimation of the Kendall's dependence function is based on the pseudo-observations

$$Z_i = \frac{1}{n-1}\sum_{j \neq i}^{n} \mathbb{1}\left\{X_j^1 < X_i^1, \ldots, X_j^d < X_i^d\right\},$$

and we consider equivalently the ones from the model

$$\widetilde{Z}_i = \frac{1}{n-1}\sum_{j \neq i}^{n} \mathbb{1}\left\{\widetilde{X}_j^1 < \widetilde{X}_i^1, \ldots, \widetilde{X}_j^d < \widetilde{X}_i^d\right\}.$$

Then, the dependence metric that we define can be computed as a L^1 norm

$$\mathcal{L}_D = \frac{1}{n}\sum_{i=1}^{n}\left|Z_{i,n} - \widetilde{Z}_{i,n}\right|,$$

where $Z_{1,n} \leq \cdots \leq Z_{n,n}$ (resp. $\widetilde{Z}_{1,n} \leq \cdots \leq Z_{n,n}$) are the order statistics associated with $\{Z_1, \ldots, Z_n\}$ (resp. $\{\widetilde{Z}_1, \ldots, \widetilde{Z}_n\}$).

Ranking score For each evaluation metric, the ranking will be determined by

1. Computing a Z-score $\mathcal{Z} = (x - \mu)/\sigma$
2. Converting to points $P = \Phi(\mathcal{Z}) * 1000$, with Φ the c.d.f. of a standard normal distribution

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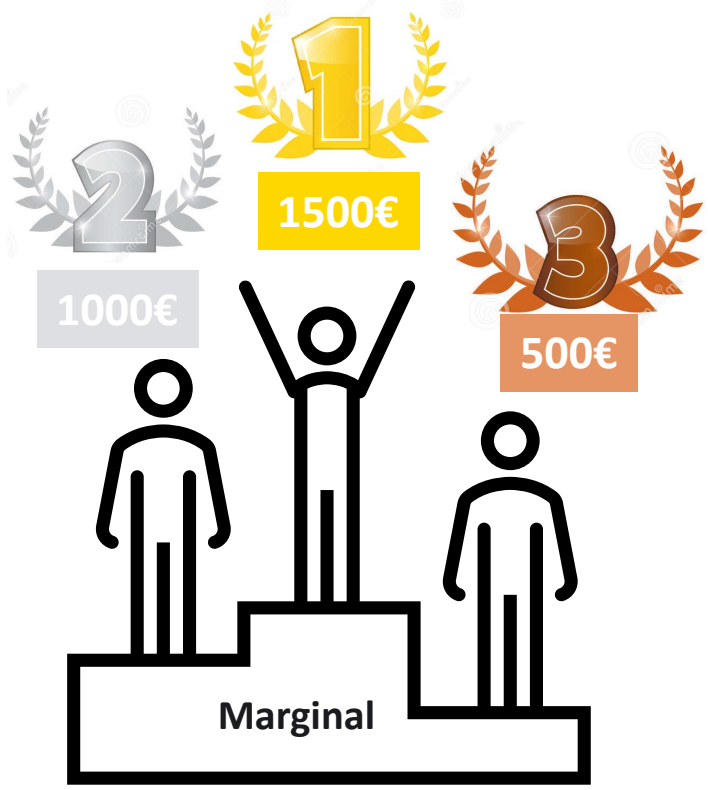
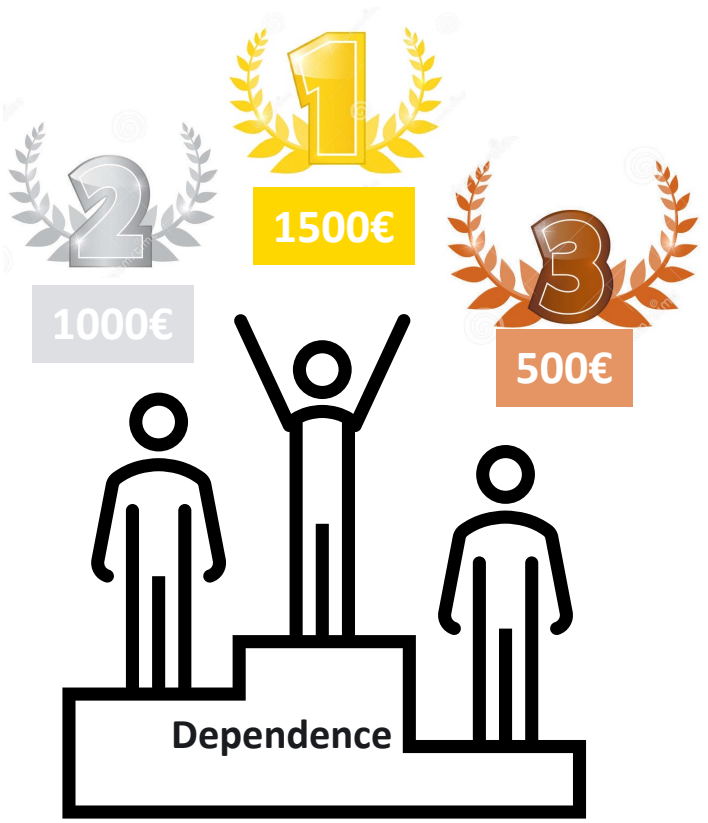
Final Ranking and Prizes

We will have a scoreboard for the two metrics: Marginal and Dependence.

A guild can win the monetary prize for both rankings!





All winning guilds will be invited to a **special session with BNP Paribas!**

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Dedicated Q&A with first 5 guilds at 6pm

FinDogz

Kurama D Team

Winx

Terran

DL Manjikai

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