

Maxime Trépanier, PhD

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Theoretical physicist with postdoctoral experience at world-class institutions, strong analytical skills and a solid background in mathematics and computer science. Seeking to transfer my experience in research, physics and statistics to a role in AI research. Keen interest in advancing AI, accelerating scientific research, and using ML to tackle real-world problems.

Career objectives

- Leverage my expertise in mathematical methods and my problem solving skills to contribute to the advancement of AI research.
- Participate in a collaborative, stimulating research environment.
- Gain more coding experience in collaborative settings.

Skills and competencies

Programming C++, Python, Mathematica; Git, L^AT_EX, Vim

ML pandas, scikit-learn, familiarity with tensorflow/keras

- Accredited by DeepLearning.AI on [ML](#) & [DeepLearning](#) Specializations (Coursera)

Research Expertise in both planning and realising concurrent research projects with competing priorities and deadlines, including:

- Experience in breaking down complex problems into manageable pieces.
- Capacity to learn quickly mathematical methods and apply them in novel ways.
- Excellent communication skills, both written and oral. (11 papers, 12 talks)

Project management Competent at managing both own work and leading teams; experience in mentoring 3 PhD students.

Team work Successful collaborations with various peers reconciling competing strategies, priorities and editorial preferences.

Work experience

2021–Present	Postdoctoral Fellow , at (string theory)	<i>Technion</i> , IL (Oct 2023–Present)
		<i>King's College London</i> , UK (Oct 2022–Oct 2023)
		<i>Perimeter Institute</i> , CA (May 2022–Sep 2022)
		<i>ITMP, Lomonosov</i> , RU (Oct 2021–Apr 2022)

Devise and pursue an innovative research program to improve our understanding of strongly-coupled systems (both collaborative and solo projects):

- Leading role in establishing a novel strategy, based on surface operators, to obtain concrete predictions in the “6d (2,0) SCFT” – an important model inaccessible to standard methods.
- Wrote 11 papers, gave 12 technical talks at various institutions, referee for JHEP.
- Organised and ran a journal club (2022) for ~ 30 researchers to promote exchanges of ideas in a dynamic environment, and keeping up with latest developments.

2017–2021 **Teaching Assistant**, *King's College London*, UK.

- Tutored about 3 classes/week for 6 courses, including *Numerical Methods* (with Python). Gave lectures, problem-solving and practical coding sessions to groups of ~ 20 students/class.
- Volunteered in student workshops to teach L^AT_EX, Python and Mathematica.

Education

2017–2021 **PhD in Theoretical Physics**, *King's College London*, UK.

Thesis title: “*Surface operators in the 6d $\mathcal{N} = (2, 0)$ theory*”

* Awarded *Alexander Graham Bell Canada Graduate Scholarship* (CGS D & PGS D, NSERC)

2015–2017 **MSc in Physics**, *Université Laval*, CA, GPA: 4.33/4.33.







Thesis title: “*Stabilité du vide*” (“Vacuum decay”)

* Awarded *Canada Graduate Scholarships* (NSERC) & *Bourse de 2^e cycle* (FRQNT)

2012–2015 **BSc in Physics**, *Université Laval*, CA, GPA: 4.19/4.33.

* 7 awards for excellence, including 3 *Undergraduate Student Research Awards* (NSERC)

Projects

- 2024  **Scaling law in gaussian process regression**, (*Python, ML*).
- Constructed a simple toy model exhibiting a scaling law between the test loss and the number of data points for a gaussian process model.
 - Generated a dataset by reusing a previous project: the Gaspard-Rice model.
 - Proposed an interpretation of the critical exponent α as the “uncertainty index”.
- 2024  **Kaggle competition: Abalone dataset**, (*Python: `scikit-learn`, ML*).
- Compared and combined gradient boosted models (LightGBM, XGBoost, CatBoost) for a regression task.
 - Rank: 386/2606
- 2023–Present  **Project Euler**, (*Python, C++*).
- Solved 88 problems on [Project Euler](#), e.g. calculating the [odds in Monopoly](#) using Markov chains.
 - Focus on algorithms/data structures and space/time complexity.
- 2015–2017  **Vacuum decay (MSc project)**, (*Python: `scipy`*).
- Numerical solution of boundary-value problem in general relativity; custom treatment of unbounded domain, divergences and thorough calibration.
 - Data generation and analysis of 225 cases, comparison to analytical results.
 - Application to real-world data resulted in a surprising bound on mass of Higgs boson.
- 2015  **Chaotic scattering in Gaspard-Rice model**, (*Python, C++*).
- Implementation and characterisation of a chaotic system based on ray-tracing; reproduced the results of original research paper.
 - Implemented 3d version in C++ to produce this short [animation](#)  (zooming on fractal).

Selected publications (see all 11 on [inspire/arXiv](#))

- [1] N. Drukker, O. Shahpo, and M. Trépanier, “Quantum holographic surface anomalies,” *J. Phys. A* **57** no. 8, (2024) 085402, [arXiv:2311.14797](#). [**1 talk**].
- [2] M. Trépanier, “Surface defects in the $O(N)$ model,” *JHEP* **09** (2023) 074, [arXiv:2305.10486](#). [**1 talk**].
- [3] C. Meneghelli and M. Trépanier, “Bootstrapping string dynamics in the 6d $\mathcal{N} = (2, 0)$ theories,” *JHEP* **07** (2023) 165, [arXiv:2212.05020](#). [**5 talks**].
- [4] N. Drukker, M. Probst, and M. Trépanier, “Defect CFT techniques in the 6d $\mathcal{N} = (2, 0)$ theory,” *JHEP* **03** (2021) 261, [arXiv:2009.10732](#). [**2 talks**].
- [5] J. R. Espinosa, J.-F. Fortin, and M. Trépanier, “Consistency of scalar potentials from quantum de Sitter space,” *Phys. Rev. D* **93** no. 12, (2016) 124067, [arXiv:1508.05343](#).

Personal interests

Fluent in French (native) and English. I am passionate about adventuring, especially climbing, running and hiking!