STEFAN TRKLJA COUNTRYMAN

Physics Ph.D. Candidate at Columbia University working in Gravitational Wave (GW) Multi-messenger Astrophysics (MMA)

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EXPERIENCE

Physics Ph.D. Student/Graduate Research Assistant

Columbia University

September 2014 – Present | New York, NY

- *2019-2022:* Developed `hpmoc`, world's first high-perf. sparse multi-resolution spherical image numeric library, to speed up likelihood calc. in `llama` (below)
  - $10^4\times$ real speedup over competing image processing libraries
  - $O(2^N) \rightarrow O(N)$ algo complexity drop via array rep. of sparse quad trees
  - Most advanced skymap plotting/algo prototyping tools in field
  - Abstract, documented API massively simplifies training/use
- *2016-2019:* Developed `llama`, 1st online search for neutrinos from GW sources
  - Pioneering custom pipeline library for fetching and statistically analyzing heterogeneous observational data streams in low-latency
  - Fastest GW/ν MMA search pipeline since introduction in 2016
  - Added Bayesian statistical method upgrade for 2019/LIGO O3
  - Most feature-rich, extensible, performant, reliable, reproducible, and mature GW multi-messenger search library to-date
- *2010-2017:* Maintained LIGO's timing system, developed and installed systems and tools for its independent diagnostic system, and documented all of it
- Applied detector and software expertise to other group science goals
- 1,000s of hours of teaching, tutoring, & outreach in math & physics

Science and Programming Outreach Consultant

World Science Festival

April 2015 – May 2016 | New York, NY

- Advised Chairman Prof. Brian Greene on outreach/education tech
- Transitioned World Science U to superior, open-source technology stack
- Designed & coded in-browser physics simulations (`kinematica.github.io`)

Founder

West End Coaching *and* skilld.co

Mid 2013 – Late 2014 | New York, NY

- Founded/operated highly-profitable tutoring company *West End Coaching*
- Founded on-demand marketplace `skilld.co` and tested MVP app

SELECTED PUBLICATIONS

Journal Articles

- Countryman, S. et al. (Jan. 2019). "Low-Latency Algorithm for Multi-messenger Astrophysics (LLAMA) with Gravitational-Wave and High-Energy Neutrino Candidates". In: *arXiv e-prints*. arXiv: `1901.05486 [astro-ph.HE]`.
- Bartos, I. et al. (Oct. 2018). "Bayesian Multi-Messenger Search Method for Common Sources of Gravitational Waves and High-Energy Neutrinos". In: *arXiv e-prints*. arXiv: `1810.11467 [astro-ph.HE]`.

HONORS & AWARDS

Special Breakthrough Prize in Fundamental Physics
For contributions to LIGO's Nobel-prize-winning first detection of gravitational waves, GW150914

Gruber Cosmology Prize
Also for GW150914

TECHNICAL SKILLS

Python | Rust | SQL | DevOps | Web | JavaScript | Docker | Optimization | Git | Bash | UNIX | Statistics | C | TeX | Numerical Methods | Scientific Computing | Technical Writing | APL | Haskell | MATLAB | Julia | FPGA | Electronics

LANGUAGES

English
French
Italian
Bosnian/Serbian/Croatian

EDUCATION

Ph.D. in Physics *(in-progress)*

Columbia University

September 2014 – May 2022 (Expected)

Thesis title: Novel Computational Methods for Image Processing and Compression with Application to Multi-Messenger Astrophysics using Gravitational Waves and High Energy Neutrinos

M.Sc. and M.Phil. in Physics

Columbia University

September 2014 – May 2017

B.Sc. in Applied Mathematics

Columbia University

September 2009 – October 2013

with English minor