

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
 - Currently pursuing patents based on methods developed
- 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
- Switched WSU to faster web-first tech stack & made physics demos

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	
System Architecture	Bash	UNIX	TeX	
Statistics	C	Numerical Methods	HPC	
Tech. Writing	APL	Haskell	MATLAB	
Julia	FPGA	Electronics	Cloud	

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