

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
- 2016-2020: Developed `llama`, 1st online search for neutrinos from GW sources
 - Pioneering object-oriented DAG 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
JS	OOP	Docker	Optimization	Git
System Architecture	Bash	UNIX	TeX	
Stats	Num. Methods	HPC	APL	C
FPGA	Julia	Tech. Writing	Haskell	
Cloud	MATLAB	Pandas	Debugging	

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