Princeton, NJ — (773) 787-9856 — sasha@kaurov.org — kaurov.org

Sasha (Alexander) Kaurov, Ph.D.

Data-focused researcher passionate about human interactions with new media. 10+ years of research in astronomy, astrophysics & cosmology and 2+ years in data-driven and machine learning-powered sociological research. Produced virtual reality science outreach shows for magazines and space agencies. Founded an international initiative on incorporating new immersive tech into science outreach with participants from 20+ countries. Taught and mentored students at the university level. US citizen.

SKILLS

- Research (20+ refereed research papers) and evidence-based hypothesis testing.
- Statistical analysis, open-ended data mining, data quality control and data reduction pipeline development for diverse large datasets and use of corresponding APIs including:
  - Multiwavelength imaging and spectroscopic data (e.g. Hubble Space Telescope data),
  - 3D simulated data including vector fields,
  - Population data (US Census, Federal Election Committee data),
  - Text-based (Twitter API, research papers with Scopus API, YouTube API),
  - Map spatial data (Google Maps API)
- Applied machine learning (TensorFlow), including Natural Language Processing, rigid and non-rigid image registration, autoencoders and incorporation of these and other ML techniques in the statistical analysis pipelines.
- 3D numerical simulations, code optimization and related high-performance and cloud-based computing (Amazon Web Services, Google Cloud).
- Development of immersive technologies and virtual worlds (VR, WebXR, Unity&Unreal).
- Scientific advising, project management and mentoring.
- Community building and management, science communication.
- Programming and scripting in Python (numpy, scipy, pandas, Google&YouTube&Maps APIs, sklearn, TF; git, bash, unix environments). Also, experienced with R, MatLab, JS, C++.
- Proficient in graphic, motion and 3D design tools (Adobe products, Blender) and office tools (Google Docs and Sheets, Microsoft Office, Latex).

WORK EXPERIENCE

The Institute for Advanced Study — *Visitor, Program in Interdisciplinary Studies*

Princeton, NJ, 08/2021 — PRESENT

- **Leveraging Public and Marketing Data for Probing Public's Perception of Science.** Together with Prof. Naomi Oreskes (Harvard University) we explore new methods of deducing public's trust in science by creating indicators from large datasets, potentially replacing traditional methods of field surveys.
  - *Establishing a collaboration with LiveRamp to use their identity resolution and data connectivity platform.*

- **AI for democratizing access to Higher Ed.** Adapted NLP and other ML techniques to analyze the freely available online learning resources and to aggregate them in a way to make them accessible to students with any background or experience.
  - *Unpublished, in the process of conducting interviews with teachers.*

- **STEM XR initiative.** Founded a network of 70+ science communicators, theater professionals and

technologists from 20+ countries that together work on the quest of combining novel immersive tech and theatrical storytelling for creating science outreach shows. — https://stemxr.org

OmniScope — *Founder*

Princeton, NJ, 06/2020 — PRESENT

Established a company to encourage the use of immersive virtual worlds for science outreach. Selected projects:

- **Science communication in the shared virtual worlds.** Established collaborations and produced immersive virtual reality shows with the Japanese Space Exploration Agency, the Earth Life Science Institute (ELSI, Tokyo Institute of Technology) and Nautilus magazine. Performed talent search, acquisition and directed these projects. — https://www.omniscope.org/virtual-worlds/

- **Online immersive theater show *En Route*.** Co-develop 2D web-based sci-fi show with leading online immersive theater specialists. Role:science consultant and technology development. — https://www.enroute.space/

The Institute for Advanced Study — *Postdoctoral researcher*

Princeton, NJ, 2016 — 07/2021

- **AMIAS fellowship** 2016 — 2017
- *Paternity leave* 01 — 06/2017
- **Eric and Wendy Schmidt fellowship** 2017 — 2018
- **William D. Loughlin fellowship** 2018 — 2019
- **IBM Einstein fellowship** 2019 — 2020
- **William D. Loughlin fellowship** 2020 — 2021

Established multiple international scientific collaborations that resulted in a series of research papers and were twice featured in the American Astronomy Society NOVA magazine. Selected projects:

- **Time-domain Astronomy and Highly Magnified Stars in Lensing Clusters.** We mine the existing data and develop methods for the upcoming space telescopes to detect the brightness variability of lensed galaxies and then build theoretical models to constrain the physics of dark matter.
  - E.g. *Highly Magnified Stars in Lensing Clusters: New Evidence in a Galaxy Lensed by MACS J0416.1-2403* 2019ApJ...880...58K — **Kaurov, Alexander A.**; Dai, Liang; Venumadhav, Tejaswi; Miralda-Escudé, Jordi; Frye, Brenda

- **Geological Evidences of Near-Earth Supernova Explosion.** We adopt numerical models of the Inter-Stellar Medium to estimate the flux of the supernova ejecta that can reach the Solar system.
  - *Simulations of 60Fe entrained in ejecta from a near-Earth supernova: Effects of observer motion* https://arxiv.org/abs/2109.11242 — Evgenii Chaikin, **Alexander A. Kaurov**, Brian D. Fields, Camila A. Correa

- **Quantitative Methods for Accessibility Estimations.** Together with Mark SubbaRao (President, International Planetarium Society) we studied the accessibility of the planetariums in the United States based on census data and Google Maps API.
  - *Planetarium commute accessibility in the United States of America* DOI: 10.22541/au.159724581.14747461—**Kaurov, Alexander A.**; *Bazhenov, Vyacheslav*; SubbaRao, Mark

The University of Chicago — *Research Assistant*
Chicago IL, 2012 — 2016

- **McCormick Fellowship** 2011 — 2012

❖ Developed analytical techniques to analyze and interpret numerical simulations.
  ➢ *On Improving Analytical Models of Cosmic Reionization for Matching Numerical Simulation* 2016ApJ...831..198K — **Kaurov, Alexander A.**

❖ As a scientific advisor, mentored three undergraduate research projects:
  ➢ Evgenii Chaikin (B.Sc., 2017), M.Sc. fellowship at the University of Bonn (Germany), currently Ph.D. student at Leiden Observatory (Netherlands).
  ➢ Nadezhda Tuberozova (B.Sc., 2018), M.Sc. student at the University of Bonn (Germany), currently NLP researcher at a private company.
  ➢ Ekaterina Leonova (B.Sc., 2019), M.Sc. fellow at the University of Geneva (Switzerland), currently Ph.D. student at the University of Amsterdam (Netherlands).

LabRepo — co-*Founder*
Chicago IL, 2014 — 2015

❖ Led a team of scientists and software engineers in building an open-source laboratory information management system for scientific researchers and high-school/college laboratory courses, with the goals to (1) promote collaboration and open data sharing and (2) provide the biomedical research community with convenient, practical and user-friendly software:
  ➢ Conceptualized and designed LIMS and communicated with a team of software engineers.
  ➢ Performed market analysis and conducted interviews with potential users (Researchers and Libraries).
  ➢ Participated in the University of Chicago Booth School of Business Polsky Accelerator program, the National Science Foundation funded regional Innovation-Corps program, and Chicago Innovation Mentors programs.
  ➢ Supervised 2 interns.

Fermilab — *Research Assistant*
Batavia IL, 2012 — 2013

- **Fermilab Fellowship in Theoretical Physics** 2012 — 2013

❖ **Cosmology and Astrophysics with 21 cm signal.** We leverage numerical cosmological simulations to forward model the observed optical and radio signals and then develop techniques capable of meaningfully interpreting the mock data.
  ➢ E.g. *Cosmic Reionization on Computers. II. Reionization History and Its Back-reaction on Early Galaxies* 2014ApJ...793...30G — Gnedin, Nickolay Y.; **Kaurov, Alexander A.**

The University of Chicago — *Teaching Assistant*
Chicago IL, 2011 — 2012

❖ Taught laboratory classes for the following courses:
  ➢ PHSC 12000 The Origin of the Universe & How We Know;
  ➢ PHSC 11900 Introductory astronomy course;
  ➢ PHSC 13500 Chemistry — The Atmosphere.

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EDUCATION

The University of Chicago — *Ph.D. in Astronomy & Astrophysics*
Chicago IL, 2011 — 2016, Thesis: "Analytical and numerical modeling of the epoch of cosmic reionization."

St. Petersburg State Polytechnic University — *B.Sc. (Nuclear astrophysics)*
St. Petersburg, Russia, 2007 — 2011, Thesis: "Multidimensional numerical simulations of neutron stars."

- **Russian Academy of Science fellowship** 2009 — 2011
  Central Astronomical Observatory of the Russian Academy of Sciences at Pulkovo, Russia
- **Ioffe Institute Fellowship** 2009 — 2010
  St. Petersburg State Polytechnic University, Russia

PUBLIC SERVICE

- The National Aeronautics and Space Administration (NASA) grant review panelist.
- Referee for Monthly Notices of the Royal Astronomical Society.
- I co-founded a mentoring program that connects undergraduate and graduate students from Eastern-European and Asian countries with mid-career scientists from all over the world. We generate around 100 mentor-mentee pairs each semester from ~20 countries. — https://www.thesciencementors.com/en

REFERENCES

- **Matias Zaldarriaga**, professor of Astronomy at the Institute for Advanced Study: matiasz@ias.edu
- **Nickolay Gnedin**, professor of Astronomy & Astrophysics at the University of Chicago and senior scientist at Fermilab: gnedin@fnal.gov
- **Mark Subbarao**, president of the International Planetarium Society, lead of NASA's Scientific Visualization Studio: mark.u.subbarao@nasa.gov
- **Piet Hut**, professor of Interdisciplinary Studies at the Institute for Advanced Study: piet@ias.edu