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# Andrew M. Adare

Software · Research · Machine Learning

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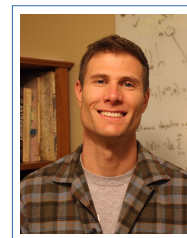
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## Professional interests

I solve perception and estimation problems to create maps used for localization and path planning by autonomous vehicles. This involves optimization, computer vision, sensor fusion, photogrammetry, localization and SLAM, as well as software engineering in various languages and environments. My background is in experimental nuclear physics research, where I acquired skills in machine learning, computing, and large-scale data analysis. I've since applied these skills beyond the academic setting in applications like robotics, interactive physics simulations, and autonomous navigation. I love building things and getting them to work beautifully.

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## Education

2009 **PhD, Physics, *University of Colorado***, Boulder, CO.

Advisor: James L. Nagle

1998 **BS, Geology, *Wheaton College***, Wheaton, IL, *Magna cum laude*.

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## Professional experience

### Current

2017-now **Research Engineer, *HERE Technologies***.

Perception and probabilistic inference for autonomous localization and mapping.

- Created a 3D perception system using cell phone-based MEMS sensors, camera, and GNSS receiver for scalable crowd-sourcing of map data. The system achieved accuracies comparable to current OEM vehicle-based perception systems.
- Developed high-quality software libraries for internal use: sensor fusion, multi-object tracking, triangulation, bundle adjustment, visual SLAM, computational and multi-view geometry, spatial rotation, and 3D visualization.
- Received outstanding achievement award in the Highly Automated Driving division in 2017.
- Promoted from Senior Research Engineer to Lead Research Engineer in 2018.
- Currently developing localization and SLAM algorithms for online use with standard late-model OEM vehicle sensors and perception systems.

### Previous

2016 **Software developer, *PhET Interactive Simulations***.

Developed interactive, open-source, HTML5-based science and math educational simulations used worldwide.

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- 2015 **Technical Co-founder, *AMP Robotics***.  
Worked on a small team to build a prototype robotic system to sort materials for recycling.
- Developed software for real-time multi-object tracking and data association, as well as GPU-powered image classification using deep neural networks
  - Hardware design and prototyping: built pneumatic vacuum gripper and end effector, micro-controller electronics and firmware for device control
  - Worked on image segmentation in highly cluttered environment (conveyor with unsorted recycling materials) using joint color and range data
- 2012–2014 **Physics Researcher, *University of Colorado/BNL***.
- High-energy nuclear physics research at [RHIC](#), the relativistic heavy-ion collider. Served as a shift leader in the [PHENIX](#) control room.
  - Applied Bayesian analysis techniques on particle data to infer properties of nuclear matter under extreme conditions.
  - Used data-driven statistical optimization techniques to perform high-precision software alignment of the multimillion dollar silicon vertex detector.
  - Served on PHENIX computing team to maintain, improve, and upgrade the PHENIX codebase.
- 2009–2012 **Physics Researcher, *Yale University/CERN***.  
High-energy experimental nuclear physics research in the Yale Relativistic Heavy Ion Group.
- Member of the [ALICE](#) experiment at the CERN Large Hadron Collider:
    - Physics: analysis of ALICE data from Pb–Pb and proton-proton collisions, with emphasis on two-particle correlations and jet reconstruction. Served as principal or secondary author on multiple publications. Frequently evaluate journal manuscripts authored by collaborators.
    - Administration: convenor of particle correlations physics analysis group; chair weekly conference meetings; support/supervise analyses of working group members; provide regular status reports at collaboration-wide meetings.
    - Service: Calibration and testing of electromagnetic calorimeter (EMCal) detector; development and maintenance of ALICE physics analysis software; data acquisition and quality assurance.
  - Participating member, STAR experiment at the Relativistic Heavy Ion Collider, Brookhaven National Laboratory (2010). Performed simulation and analysis of Au–Au and proton-proton data, leading to a preliminary physics result presented at two conferences in Summer 2010.
- 2004–2009 **Doctoral student, *University of Colorado***.  
High-energy nuclear physics research at the PHENIX experiment, Brookhaven National Laboratory.
- Analyzed data from from the 2005-2007 running periods: studied jet modification in heavy ion collisions via two-particle angular correlations. Also assisted in development of analysis techniques for angular correlations involving direct photons.
  - Helped build the data acquisition, electronics, and gas system for a prototype resistive plate chamber (RPC) detector which was installed as an upgrade to the PHENIX detector.
  - Developed and maintained analysis and simulation software, some components of which remain in wide use.

### Additional experience

- 2007–2009 **Physics tutor, *Dal Ward Academic Center*, CU Boulder**.  
Individual and group tutoring in various undergraduate physics courses ranging from nontechnical survey courses to quantum mechanics and electromagnetic theory.
- 2003–2004 **Graduate Teaching Assistant, *Physics Dept.*, CU Boulder**.  
Responsible for several introductory-level physics recitation and lab sections. Course material included algebra and calculus-based electricity and magnetism, basic circuits, and geometric optics.

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- 2002–2004 **Research Assistant, National Institute of Standards and Technology**, Boulder, CO.  
Contributed data and measurements for the book *Experimental Techniques for Low-Temperature Measurements* by J. W. Ekin (Oxford University Press). Lab work involved measurement of fundamental properties of metal alloys in cryogenic environments (magnetic susceptibility and magneto-resistance); critical current density measurements of low-temperature superconducting alloys as a function of strain, magnetic field, and current.
  - 1999–2002 **CAD and GIS Technician, City & County of Broomfield Engineering**, Broomfield, CO.  
GIS mapping and CAD drafting for civil engineering and municipal planning projects using AutoCAD and ArcView GIS.
  - 1998–1999 **Geotech/Geologist, Carrollton Resources**, Baton Rouge, LA.  
Conducted geological research for oil and gas exploration projects in the central Gulf Coast region, primarily onshore fields in Northern and Southern Louisiana. Research involved subsurface mapping from existing well data using geographical information systems, as well as processing and interpretation of three-dimensional seismic survey data used for subsurface structural tomography.

## Technical Skills

- Programming languages Python, C/C++, Julia, Javascript, POSIX shells
- Data analysis Probability, statistics, error propagation, visualization
- Tools & frameworks SciPy/NumPy, OpenCV, ROOT, Make, CMake, Arduino, ARM mbed, AVR libc
- Hardware Microcontrollers, single-board computers, machining, welding
- Speaking Scientific presentation *Over 30 talks, many at large international conferences.*
- Languages French (proficient) *Extended travel/residence in France and Switzerland, 2010-2012.*

## Other activities

- 2018-now **Founder, A4 Prototyping Ltd.**, Longmont, CO.  
Side business providing prototype design and manufacturing services, especially for the automated driving industry: machining, TIG welding, metal fabrication, CAD/CAM.
- 2015-now **Instructor, Solid State Depot**, Boulder, CO.  
Instructor for embedded systems, robotics algorithms, machining, and welding. Served on board of directors 2017-2018.
- 2015 **Machining course, Physics Trades Teaching Lab**, University of Colorado.  
Safety; precision measurement techniques; small-tolerance operation of lathes and vertical milling machines.
- 2015 **Unsupervised Learning and Deep Learning tutorial, Stanford Online**.  
Implemented image preprocessing and classification algorithms using the Julia language (<https://github.com/andrewadare/uflidl-tutorial>)
- 2012 **Co-organizer, Initial State Fluctuations and Final State Correlations in Heavy-Ion Collisions**, Trento, Italy, July 2012 (<http://flowfluctuation.sciencesconf.org>).
- 2012 **Peer reviewer, European Journal of Physics C**.  
Provide critical reports on physics manuscripts submitted to the journal and correspond with authors.

## Selected publications and presentations

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**Note:**

I am listed as a co-author on over [175](#) publications with experimental collaborations. These publications are the subset to which I've made major contributions.

**Selected publications**

A. Adare et al. Single electron yields from semileptonic charm and bottom hadron decays in Au+Au collisions at 200 GeV. *Phys. Rev.*, C93(3):034904, 2016.

J. D. Orjuela Koop, A. Adare, D. McGlinchey, and J. L. Nagle. Azimuthal Anisotropy Relative to the Participant Plane from AMPT in Central p+Au, d+Au, and <sup>3</sup>He+Au Collisions at 200 GeV. *arXiv*, (preprint):1501.06880, 2015.

J.L. Nagle, A. Adare, S. Beckman, T. Koblesky, J. Orjuela Koop, et al. Exploiting Intrinsic Triangular Geometry in Relativistic He3+Au Collisions to Disentangle Medium Properties. *Phys.Rev.Lett.*, 113(11):112301, 2014.

Andrew M. Adare, Michael P. McCumber, James L. Nagle, and Paul Romatschke. Examination whether heavy quarks carry information on the early-time coupling of the quark-gluon plasma. *Phys.Rev.*, C90(2):024911, 2014.

Andrew Adare, Matthew Luzum, and Hannah Petersen. Initial state fluctuations and final state correlations: Status and open questions. *Phys.Scripta*, 87:048001, 2013.

Kenneth Aamodt et al. Harmonic decomposition of two-particle angular correlations in Pb-Pb collisions at  $\sqrt{s_{NN}} = 2.76$  TeV. *Phys.Lett.*, B708:249–264, 2012. (134 citations).

A. Adare et al. Trends in Yield and Azimuthal Shape Modification in Dihadron Correlations in Relativistic Heavy Ion Collisions. *Phys.Rev.Lett.*, 104:252301, 2010. (Doctoral thesis publication - 61 citations).

Anne Sickles, Michael P. McCumber, and Andrew Adare. Extraction of Correlated Jet Pair Signals in Relativistic Heavy Ion Collisions. *Phys.Rev.*, C81:014908, 2010.

**Talks ([andrewadare.github.io/talks](http://andrewadare.github.io/talks))**

Inferring modification of charm and beauty hadrons from simulated electron data. *Quark Matter (Darmstadt, Germany)*, 2014.

The future of physics at rhic. *APS Division of Nuclear Physics Annual Meeting*, 2013.

Heavy quark diffusion in a hydrodynamically expanding medium: a langevin dynamical calculation. *Winter Workshop on Nuclear Dynamics*, 2013.

Particle correlations from alice: Latest results. *Quark Matter (Washington DC, USA)*, 2012.

Triggered dihadron correlations in pb-pb collisions from the alice experiment. *Quark Matter (Annecy, France)*, 2011.

Hydrodynamic flow results from the large hadron collider: the latest and greatest. *American Physical Society April Meeting*, 2012.

Harmonic decomposition of two particle angular correlations in pb–pb collisions at 2.76 tev. *Workshop on Particle Correlations and Fluctuations*, 2011.

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Dihadron correlations at rhic and the lhc with an update from the alice experiment. *Winter Workshop on Nuclear Dynamics*, 2011.

Jet-triggered di-hadron correlations: Methodology, interpretation and results. *Hot Quarks (La Londe les Maures, France)*, 2010.

Triggered di-hadron correlations in Pb–Pb collisions from the ALICE experiment. *J.Phys.G*, G38:124091, 2011.

Jet-triggered dihadron correlations. *J.Phys.Conf.Ser.*, 270:012018, 2011.

Understanding jet shapes with  $\pi^0$ -hadron correlations. *Eur.Phys.J.*, C62:127–131, 2009.

High- $p_T$  jet fragmentation in Au + Au collisions. *J.Phys.G*, G35:104089, 2008.