JOHN M. AIKEN

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EDUCATION

Ph. D. — **Department of Physics**
University of Oslo — *2020*

Master of Science — **Department of Physics and Astronomy**
Georgia State University — *2013*

Bachelor of Science — **Department of Physics and Astronomy**
Georgia State University — *2010*

PROFESSIONAL APPOINTMENTS

Researcher — **Department of Physics, Njord Centre for Studies of the Physics of the Earth**
University of Oslo — *September 2020 to present*

- Developed deep learning models for image segmentation of rock core samples to assess CO2 storage
- Investigated glacier instabilities in Svalbard using gradient boosted models

PhD Candidate — **Department of Physics, Centre for Computing in Science Education**
University of Oslo — *September 2017 to September 2020*

- Built gradient boosting models of rock fracturing in 3D tomography experiments to predict volumetric changes of fractures
- Produced predictive models of when students graduate using gradient boosted discrete time hazard models
- Used random forest classifiers to predict which students will switch majors
- Reduced production SQL database of 200+ tables to a 7 table analytics database
- Directed summer data science internship which has trained 11 students from 8 countries

PhD Candidate — **Section 2.6 - Seismic Hazard and Risk Dynamics**
GFZ-Potsdam — *February 2016 - September 2017*

- Developed earthquake catalog data explorer using python
- Analyzed earthquake catalogs to estimate stress build up on faults across Japan
- Developed master level course in seismic hazard analysis using python

Research Associate I — **School of Physics**
Georgia Institute of Technology — *December 2013 - June 2015*

- Using linear regression models demonstrated that video content dictated how students used different video lectures
- Built analytics database for students in Massive Open Online Courses using click data from videos and web pages, course performance data, and survey data

VISITING APPOINTMENTS

Data Science PhD Intern — **Data Science Group**
Domos — *August 2019 - December 2019*

- Built gradient boosted models to investigate network latency in unknown wireless network topologies

Software Developer — **JILA**
University of Colorado, Boulder — *June 2015 - January 2016*

- Built python based web application for automated reporting for a survey used in 130+ universities worldwide
- Published public data set for 70,000 survey responses

GRANTS AWARDS

The Njord Centre Summer Award	2019
The Njord Centre Diversity Award	2018
Physics Education Research Topical Group Travel Grant (500 USD)	2018
Paper selected as Notable Paper of the Physics Education Research Conference Proceedings	2016
Physics Education Research Topical Group Travel Grant (500 USD)	2016
Physics Education Research Topical Group Travel Grant (500 USD)	2015
Best Graduate Student Poster, North Carolina Section of American Association of Physics Teachers	2013
Best Graduate Student Poster, North Carolina Section of American Association of Physics Teachers	2011

TEACHING EXPERIENCE

University of Potsdam 2016 - 2017

The Georgia Institute of Technology 2012 - 2014

Georgia State University 2010 - 2012

SERVICE

Peer Reviewer
Journal of Geophysical Research - Solid Earth *2020 - present*

Workshop Facilitator **Machine Learning in Physics Education Research**
American Association of Physics Teachers Meeting *2019*

Internship Facilitator **Educational Data Mining Summer Internship**
University of Oslo Centre for Computing in Science Education *2018 - 2019*

Guest Editor **Focused Collection on Quantitative Methods in PER: A Critical Examination**
Physical Review Physics Education Research *2018 - 2019*

Peer Reviewer
Physical Review Physics Education Research *2017 - present*

Peer Reviewer
The Physics Teacher *2017 - present*

Research Track Committee Member
EMOOCS Conference *2017*

Committee Member **Committee on Educational Technologies**
American Association of Physics Teachers *2013 - 2015*

INVITED TALKS

Using Machine Learning to Identify Fractures and Vesicles in Faroe Island Rock Samples 2021
EarthFlows, University of Oslo

A New Framework for Evaluating Statistical Models in Physics Education Research 2020
University College Dublin

Investigating Physics Students Pathways 2016
Georgia State University

From Physics to Data Science 2016
Texas State University

Student Engagement with Video Course Content in Introductory Mechanics 2015
American Association of Physics Teachers Meeting

Using the Tools of Online Analytics and Big Data in the On-Campus Classroom 2014
Physics Education Research Conference

What Do We Learn From Students Watching Lecture Videos? 2014
University of Colorado, Boulder

PUBLICATIONS — MACHINE LEARNING IN GEOPHYSICAL PROCESSES

[1] Coline Bouchayer, John M. Aiken, Kjetil Thørgersen, Thomas V. Schuler, and François Renard. "Gradient boosting predicts and explains surge-type glaciers in Svalbard". In: *Journal of Geophysical Research - Solid Earth* (In Preparation).

[2] Jessica McBeck, John M. Aiken, Benoit Cordonnier, Yehuda Ben-Zion, and François Renard. "Predicting fracture network development in crystalline rocks". In: *Journal of Geophysical Research - Solid Earth* (In Review).

[3] Jessica McBeck, John M. Aiken, Benoit Cordonnier, and François Renard. "How accurate are we – Part 2: The influence of segmentation method on fracture network properties calculated from X-ray microtomography data". In: *Journal of Geophysical Research - Solid Earth* (In Preparation).

[7] Jessica Ann McBeck, John M. Aiken, Joachim Mathiesen, Yehuda Ben-Zion, and François Renard. "Deformation precursors to catastrophic failure in rocks". In: *Geophysical Research Letters* 47.24 (2020), e2020GL090255. DOI: 10.1029/2020GL090255.

[8] Jessica McBeck, John M. Aiken, Yehuda Ben-Zion, and François Renard. "Predicting the proximity to macroscopic failure using local strain populations from dynamic in situ X-ray tomography triaxial compression experiments on rocks". In: *Earth and Planetary Science Letters* 543 (2020), p. 116344. DOI: 10.1016/j.epsl.2020.116344.

[10] Jessica McBeck, Neelima Kandula, John M. Aiken, Benoit Cordonnier, and François Renard. "Isolating the factors that govern fracture development in rocks throughout dynamic in situ X-ray tomography experiments". In: *Geophysical Research Letters* 46.20 (2019), pp. 11127–11135. DOI: 10.1029/2019GL084613.

[16] John M. Aiken, Chastity Aiken, and Fabrice Cotton. “A Python library for teaching computation to seismology students”. In: *Seismological Research Letters* 89.3 (2018), pp. 1165–1171. DOI: 10.1785/0220170246.

PUBLICATIONS — EDUCATIONAL DATA MINING

[4] Joseph Wilson, Benjamin Pollard, John M. Aiken, Marcos D. Caballero, and H.J. Lewandowski. “Classification of Open-Ended Responses to a Research-Based Assessment Using Natural Language Processing”. In: *Physical Review Physics Education Research* (In Preparation).

[5] John M. Aiken and H.J. Lewandowski. “Data sharing model using the Colorado Learning Attitudes about Science Survey for Experimental Physics 70000 response data set”. In: *Physical Review Physics Education Research* (In Review).

[6] John M. Aiken, Riccardo De Bin, H.J. Lewandowski, and Marcos D. Caballero. “A new framework for evaluating statistical models in physics education research”. In: *Physical Review Physics Education Research* (In Review).

[9] John M. Aiken, Riccardo De Bin, Morten Hjorth-Jensen, and Marcos D. Caballero. “Predicting time to graduation at a large enrollment American university”. In: *Plos one* 15.11 (2020), e0242334. DOI: 10.1371/journal.pone.0242334.

[11] John M. Aiken, Rachel Henderson, and Marcos D. Caballero. “Modeling student pathways in a physics bachelor’s degree program”. In: *Physical Review Physics Education Research* 15 (1 May 2019), p. 010128. URL: https://link.aps.org/doi/10.1103/PhysRevPhysEducRes.15.010128.

[12] Alexis V. Knaub, John M. Aiken, and Marcos D. Caballero. “Editorial: Focused Collection: Quantitative Methods in PER: A Critical Examination”. In: *Physical Review Physics Education Research* 15 (2 July 2019), p. 020001. DOI: 10.1103/PhysRevPhysEducRes.15.020001.

[13] Alexis V. Knaub, John M. Aiken, and Lin Ding. “Two-phase study examining perspectives and use of quantitative methods in physics education research”. In: *Physical Review Physics Education Research* 15.2 (2019). URL: https://journals.aps.org/prper/abstract/10.1103/PhysRevPhysEducRes.15.020102.

[14] Nicholas T. Young, Grant Allen, John M. Aiken, Rachel Henderson, and Marcos D. Caballero. “Identifying features predictive of faculty integrating computation into physics courses”. In: *Physical Review Physics Education Research* 15.1 (2019). DOI: 10.1103/PhysRevPhysEducRes.15.010114.

[15] Robert Solli, John Aiken, Rachel Henderson, and Marcos Caballero. “Examining the relationship between student performance and video interactions”. In: *Physics Education Research Conference 2018*. PER Conference. Washington, DC, Aug. 2018. URL: https://arxiv.org/abs/1807.01912.

[17] Scott S. Douglas, John M. Aiken, Edwin F. Greco, Michael F. Schatz, and Shih-Yin Lin. “Do-it-yourself whiteboard-style physics video lectures”. In: *The Physics Teacher* 55.1 (2017), pp. 22–24. DOI: 10.1119/1.4972492.

[18] John M. Aiken and Marcos D. Caballero. “Methods for Analyzing Pathways through a Physics Major”. In: *2016 Physics Education Research Conference Proceedings*. Ed. by D.L. Jones, L. Ding, and A. Traxler. Sacremento, CA, July 2016, pp. 28–31. DOI: 10.1119/perc.2016.pr.002.

[19] Bethany R. Wilcox, Benjamin M. Zwickl, Robert D. Hobbs, John M. Aiken, Nathan M. Welch, and H. J. Lewandowski. “Alternative model for administration and analysis of research-based assessments”. In: *Physical Review Physics Education Research* 12 (1 June 2016), p. 010139. DOI: 10.1103/PhysRevPhysEducRes.12.010139.

[20] Shih-Yin Lin, John M. Aiken, Daniel T. Seaton, Scott S. Douglas, Edwin F. Greco, Brian D. Thoms, and Michael F. Schatz. “Exploring physics students’ engagement with online instructional videos in an introductory mechanics course”. In: *Physical Review Physics Education Research* 13.2 (2017). DOI: 10.1103/PhysRevPhysEducRes.13.020138.

[21] Scott S. Douglas, John M. Aiken, Shih-Yin Lin, Edwin F. Greco, Emily Alicea-Muñoz, and Michael F. Schatz. “Peer assessment of student-produced mechanics lab report videos”. In: *Physical Review Physics Education Research* 13.2 (2017). DOI: 10.1103/PhysRevPhysEducRes.13.020126.

[22] Shih-Yin Lin, Scott S. Douglas, John M. Aiken, Liu Chien-Lin, Edwin F. Greco, Brian D. Thoms, Marcos D. Caballero, and Michael F. Schatz. “Peer evaluation of video lab reports in an introductory physics MOOC”. In: 2014. URL: https://arxiv.org/abs/1407.4714.

[23] Scott S. Douglas, Shih-Yin Lin, John M. Aiken, Brian D. Thoms, Edwin F. Greco, Marcos D. Caballero, and Michael F. Schatz. “Peer evaluation of video lab reports in a blended introductory physics course”. In: 2014. URL: https://arxiv.org/abs/1407.3248.

[24] Marcos D. Caballero, John B. Burk, John M. Aiken, Brian D. Thoms, Scott S. Douglas, Erin M. Scanlon, and Michael F. Schatz. “Integrating numerical computation into the modeling instruction curriculum”. In: *The Physics Teacher* 52.1 (2014), pp. 38–42. DOI: 10.1119/1.4849153.

[25] John M. Aiken, Shih-Yin Lin, Scott S. Douglas, Edwin F. Greco, Brian D. Thoms, Michael F. Schatz, and Marcos D. Caballero. “The initial state of students taking an introductory physics MOOC”. In: 2013. URL: https://arxiv.org/abs/1307.2533.

[26] John M. Aiken, Marcos D. Caballero, Scott S. Douglas, John B. Burk, Erin M. Scanlon, Brian D. Thoms, and Michael F. Schatz. “Understanding student computational thinking with computational modeling”. In: vol. 1513. 2013, pp. 46–49. DOI: 10.1063/1.4789648.

REFERENCES

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