Justin Ellis | Curriculum Vitae

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justin-ellis

Physics Frontier Center (PFC) postdoctoral fellow at West Virginia University (WVU) and visiting postdoctoral scholar at NC State working on several data analysis tasks for pulsar timing arrays. Passionate about data analysis/science, machine learning, and data visualization. Have leadership experience working in large and small collaborations.

Education

University of Wisconsin Milwaukee | **Milwaukee, WI**
PhD (Physics) | *July 2011–June 2014*

West Virginia University | **Morgantown, WV**
PhD student in Physics | *August 2009–June 2011*

West Virginia University | **Morgantown, WV**
B.S. in Physics, Mathematics, Astronomy minor | *January 2007–June 2009*

Shepherd University | **Shepherdstown, WV**
B.S. student in Mathematics | *August 2004–January 2006*

Doctoral Thesis

Title: *Searching for Gravitational Waves Using Pulsar Timing Arrays*

Advisor: Dr. Xavier Siemens

Description: This thesis details several new frequentist and Bayesian detection and characterization schemes for gravitational waves using pulsar timing arrays. These methods were applied to several real and synthetic datasets to produce stringent constraints on gravitational waves from supermassive black hole binaries.

Professional Experience

Research Experience

NC State University | **Raleigh, NC**
Visiting Postdoctoral Scholar (Statistics Dept.) | *September 2017–present*

West Virginia University | **Morgantown, WV**
PFC Postdoctoral Fellow | *September 2017–present*

NASA Jet Propulsion Laboratory | **Pasadena, CA**
Einstein Postdoctoral Fellow | *September 2014–September 2017*

California Institute of Technology | **Pasadena, CA**
Visiting scholar (TAPIR group) | *September 2014–September 2017*

University of Wisconsin Milwaukee | **Milwaukee, WI**
Graduate Research Assistant, Advisor: Dr. Xavier Siemens | *July 2011–June 2014*

West Virginia University | **Morgantown, WV**
Graduate Research Assistant, Advisor: Dr. Maura McLaughlin | *August 2009–June 2011*

West Virginia University | **Morgantown, WV**
Undergraduate Research Assistant, Advisor: Dr. Earl Scime | *June 2008–June 2009*

Shepherd University | **Shepherdstown, WV**
Undergraduate Research Assistant, Advisor: Dr. Jason Best | *August 2005–January 2006*

Teaching Experience...

California Institute of Technology | **Pasadena, CA**
Co-organizer of NANOGrav student workshop | *March 2016*

California Institute of Technology | **Pasadena, CA**
Co-organizer of NANOGrav detection group workshop | *September 2015*

West Virginia University | **Morgantown, WV**
Tutor (calculus based introductory physics) | *January 2010–August 2010*

West Virginia University | **Morgantown, WV**
Lab Instructor (calculus based introductory physics) | *January 2008–August 2010*

West Virginia University | **Morgantown, WV**
Lab Instructor (algebra based introductory physics) | *September 2007–December 2007*

Awards

2015: Chair of NANOGrav Gravitational Wave Detection Working Group
2014: Einstein Fellowship (JPL/Caltech)
2014: Papastamatiou Scholarship (UWM)
2013: Distinguished Dissertation Fellowship (UWM)
2013: NASA Wisconsin Space Grant Consortium Fellowship
2012: Blue Apple Award (22nd Midwest Relativity Meeting)
2012: NASA Wisconsin Space Grant Consortium Fellowship
2011: Best Graduate Student Oral Presentation (West Virginia Academy of Science)
2009: Outstanding Physics Senior Award (WVU)
2008: Reddy Scholarship for Academic Excellence (WVU)
2008: Eberly College of Arts and Sciences Award for Academic Excellence (WVU)

Computer skills

OS: OSX, Linux/Unix, Windows
Programming: Python, R, C/C++, Fortran, Matlab, Mathematica
Typography: LaTeX, Microsoft Office, Pages, OpenOffice, Keynote
Data Science: Scikit-learn, Pandas, SQL, Keras, TensorFlow

Professional Affiliations

American Physical Society: Member
American Astronomical Society: Member
North American Nanohertz Observatory for Gravitational waves (NANOGrav): Full member

International Pulsar Timing Array (IPTA): Member

Recent presentations

Invited Talks

April 2016: *PTA searches for Gravitational Waves: Astrophysics with non-detections*, University of Wisconsin Milwaukee CGCA Seminar, Milwaukee WI

April 2016: *Astrophysics with Pulsar Timing Arrays*, Northwestern University Lunch Seminar, Evanston, IL

November 2014: *Gravitational Wave Science Using Pulsar Timing Arrays*, Embry-Riddle University Colloquium, Prescott, AZ

October 2014: *Pulsar Timing Arrays: A Galactic Scale Gravitational Wave Detector*, Montana State Physics Department Colloquium, Bozeman, MT

October 2014: *Data Analysis for Pulsar Timing Arrays*, Montana State Physics Department Seminar, Bozeman, MT

June 2014: *The IPTA continuous wave search project.*, IPTA Meeting, Banff, Canada

July 2013: *Searching for Gravitational Waves using Pulsar Timing Arrays''* , Cambridge University Seminar, Cambridge, UK

June 2013: *Single Source Detection and Upper Limits with IPTA data*, IPTA Meeting, Krabi Beach, Thailand

June 2012: *An Overview of Single-Source Detection Algorithms*, IPTA Meeting, Kiama, Australia

Contributed Talks

November 2017: *Introducing enterprise*, NANOGrav collaboration meeting, Lafayette, PA

April 2017: *What! There are distributions other than Gaussians?!*, NANOGrav collaboration meeting, Morgantown, WV

March 2017: *The physical, statistical, and computational challenges of Pulsar Timing*, ICTS Meeting, Bangalore, India

June 2016: *Trans-dimensional pulsar timing data analysis*, IPTA Meeting, Stellenbosch, South Africa

April 2016: *Trans-dimensional signal modeling in PTA data*, APS April Meeting, Salt Lake City, UT

August 2015: *Constraining Supermassive Black Hole Binary Dynamics Using Pulsar Timing Data*, IAU Meeting, Honolulu, HI

April 2015: *Preliminary NANOGrav limits on the isotropic stochastic GWB from the 9-year data release*, APS April Meeting, Baltimore, MD

January 2015: *Searching for GWs using pulsar timing arrays*, AAS Meeting, Seattle, WA

April 2014: *NANOGrav Limits on Gravitational Waves from Individual Supermassive Black Hole Binaries in Circular Orbits*, APS April Meeting, Savannah, GA

January 2014: *I get by with a little help from my friends: Enhancing PTA sensitivity to GWs using EM counterparts'*, AAS Meeting, Washington DC

October 2013: *Gravitational Wave Detection with Pulsar Timing Arrays*, CaJAGWR Seminar Caltech, Pasadena, CA

October 2013: *Gravitational Wave Detection with Pulsar Timing Arrays*, JPL Seminar, Pasadena, CA

August 2013: *Searching for Gravitational Waves using Pulsar Timing Arrays'*, Wisconsin Space Grant Consortium Conference, Milwaukee, WI

July 2013: *Continuous Gravitational Wave Search Methods and Results from PTAs*, 10th Edoardo Amldi Conference on Gravitational Waves, Warsaw, Poland

January 2013: *When Will We Detect GWs?*, Physical Applications of Millisecond Pulsars, Aspen, CO

January 2013: *Gravitational Wave Searches with Pulsar Timing Data*, AAS Meeting, Long Beach, CA

September 2012: *Gravitational Wave Searches with Pulsar Timing Arrays*, 22nd Midwest Relativity Meeting, Chicago, IL

August 2012: *Gravitational Wave Searches with Pulsar Timing Data*, IAU Meeting, Beijing, China

November 2011: *Detection Methods for Continuous Gravitational Waves Using Pulsar Timing Arrays*, 23rd Midwest Relativity Meeting, Urbana, IL

June 2011: *Detection of Continuous Gravitational Waves with Pulsar Timing Arrays*, IPTA Meeting, Snowshoe, WV

Posters

January 2012: *Bayesian Methods for Covariance Estimation of Pulsar Timing Residuals*, AAS Meeting, Austin, TX

July 2011: *Detection Methods for Continuous Gravitational Waves Using Pulsar Timing Arrays*, 9th Edoardo Amaldi Conference on Gravitational Waves, Cardiff, Wales

January 2011: *Continuous Gravitational Wave Searches in Pulsar Timing Data*, AAS Meeting, Seattle, WA

June 2010: *The impact of a stochastic gravitational-wave background on pulsar timing parameters'*, IPTA Meeting, Leiden, Netherlands

November 2008: *A magneto-optic probe for magnetic fluctuation measurements*, 0th Annual Meeting of the Division of Plasma Physics (DPP), Dallas Texas

Publications

H. Tak, **J. A. Ellis**, S. Ghosh. Robust and Accurate Inference via a Mixture of Gaussian and Student's t Errors. *Submitted to JCGS*, arXiv:1707.03057, 2017

E. Fonseca, T. T. Pennucci, **J. A. Ellis**, I. H. Stairs, D. J. Nice, S. M. Ransom, P. B. Demorest, Z. Arzoumanian, K. Crowter, T. Dolch, R. D. Ferdman, M. E. Gonzalez, G. Jones, M. L. Jones, M. T. Lam, L. Levin, M. A. McLaughlin, K. Stovall, J. K. Swiggum, and W. Zhu. The NANOGrav Nine-year Data Set: Mass and Geometric Measurements of Binary Millisecond Pulsars. *Astrophys. J.*, 832:167, December 2016

J. A. Ellis and N. J. Cornish. Transdimensional Bayesian approach to pulsar timing noise analysis. *Phys. Rev. D*, 93(8):084048, April 2016.

S. R. Taylor, M. Vallisneri, **J. A. Ellis**, C. M. F. Mingarelli, T. J. W. Lazio, and R. van Haasteren. Are We There Yet? Time to Detection of Nanohertz Gravitational Waves Based on Pulsar-timing Array Limits. *Astrophys. J. Lett*, 819:L6, March 2016.

Z. Arzoumanian, A. Brazier, S. Burke-Spolaor, S. J. Chamberlin, S. Chatterjee, B. Christy, J. M. Cordes, N. J. Cornish, K. Crowter, P. B. Demorest, X. Deng, T. Dolch, **J. A. Ellis**, R. D. Ferdman, E. Fonseca, N. Garver-Daniels, M. E. Gonzalez, F. Jenet, G. Jones, M. L. Jones, V. M. Kaspi, M. Koop, M. T. Lam, T. J. W. Lazio, L. Levin, A. N. Lommen, D. R. Lorimer, J. Luo, R. S. Lynch, D. R. Madison, M. A. McLaughlin, S. T. McWilliams, C. M. F. Mingarelli, D. J. Nice, N. Palliyaguru, T. T. Pennucci, S. M. Ransom, L. Sampson, S. A. Sanidas, A. Sesana, X. Siemens, J. Simon, I. H. Stairs, D. R. Stinebring, K. Stovall, J. Swiggum, S. R. Taylor, M. Vallisneri, R. van Haasteren, Y. Wang, W. W. Zhu, and The NANOGrav Collaboration. The NANOGrav Nine-year Data Set: Limits on the Isotropic Stochastic Gravitational Wave Background. *Astrophys. J.*, 821:13, April 2016.

W. W. Zhu, I. H. Stairs, P. B. Demorest, D. J. Nice, **J. A. Ellis**, S. M. Ransom, Z. Arzoumanian, K. Crowter, T. Dolch, R. D. Ferdman, E. Fonseca, M. E. Gonzalez, G. Jones, M. L. Jones, M. T. Lam, L. Levin, M. A.

McLaughlin, T. Pennucci, K. Stovall, and J. Swiggum. Testing Theories of Gravitation Using 21-Year Timing of Pulsar Binary J1713+0747. *Astrophys. J.*, 809:41, August 2015.

S. J. Chamberlin, J. D. E. Creighton, X. Siemens, P. Demorest, **J. A. Ellis**, L. R. Price, and J. D. Romano. Time-domain implementation of the optimal cross-correlation statistic for stochastic gravitational-wave background searches in pulsar timing data. *Phys. Rev. D*, 91(4):044048, February 2015.

Z. Arzoumanian, A. Brazier, S. Burke-Spolaor, S. J. Chamberlin, S. Chatterjee, J. M. Cordes, P. B. Demorest, X. Deng, T. Dolch, **J. A. Ellis**, R. D. Ferdman, N. Garver-Daniels, F. Jenet, G. Jones, V. M. Kaspi, M. Koop, M. T. Lam, T. J. W. Lazio, A. N. Lommen, D. R. Lorimer, J. Luo, R. S. Lynch, D. R. Madison, M. A. McLaughlin, S. T. McWilliams, D. J. Nice, N. Palliyaguru, T. T. Pennucci, S. M. Ransom, A. Sesana, X. Siemens, I. H. Stairs, D. R. Stinebring, K. Stovall, J. Swiggum, M. Vallisneri, R. van Haasteren, Y. Wang, W. W. Zhu, and NANOGrav Collaboration. The NANOGrav Nine-year Data Set: Observations, Arrival Time Measurements, and Analysis of 37 Millisecond Pulsars. *submitted to ApJ*, 2015.

Z. Arzoumanian, A. Brazier, S. Burke-Spolaor, S. J. Chamberlin, S. Chatterjee, J. M. Cordes, P. B. Demorest, X. Deng, T. Dolch, **J. A. Ellis**, R. D. Ferdman, N. Garver-Daniels, F. Jenet, G. Jones, V. M. Kaspi, M. Koop, M. T. Lam, T. J. W. Lazio, A. N. Lommen, D. R. Lorimer, J. Luo, R. S. Lynch, D. R. Madison, M. A. McLaughlin, S. T. McWilliams, D. J. Nice, N. Palliyaguru, T. T. Pennucci, S. M. Ransom, A. Sesana, X. Siemens, I. H. Stairs, D. R. Stinebring, K. Stovall, J. Swiggum, M. Vallisneri, R. van Haasteren, Y. Wang, W. W. Zhu, and NANOGrav Collaboration. Gravitational Waves from Individual Supermassive Black Hole Binaries in Circular Orbits: Limits from the North American Nanohertz Observatory for Gravitational Waves. *Astrophys. J.*, 794:141, October 2014.

X. Siemens, **J. A. Ellis**, F. Jenet, and J. D. Romano. The stochastic background: scaling laws and time to detection for pulsar timing arrays. *Classical and Quantum Gravity*, 30(22):224015, 2013.

J. A. Ellis, X. Siemens, and R. van Haasteren. An Efficient Approximation to the Likelihood for Gravitational Wave Stochastic Background Detection Using Pulsar Timing Data. 769:63, May 2013.

J. A. Ellis. A bayesian analysis pipeline for continuous gw sources in the pta band. *Classical and Quantum Gravity*, 30(22):224004, 2013.

P. B. Demorest, R. D. Ferdman, M. E. Gonzalez, D. Nice, S. Ransom, I. H. Stairs, Z. Arzoumanian, A. Brazier, S. Burke-Spolaor, S. J. Chamberlin, J. M. Cordes, **J. A. Ellis**, L. S. Finn, P. Freire, S. Giampanis, F. Jenet, V. M. Kaspi, J. Lazio, A. N. Lommen, M. McLaughlin, N. Palliyaguru, D. Perrodin, R. M. Shannon, X. Siemens, D. Stinebring, J. Swiggum, and W. W. Zhu. Limits on the Stochastic Gravitational Wave Background from the North American Nanohertz Observatory for Gravitational Waves. 762:94, January 2013.

J. A. Ellis, X. Siemens, and J. D. E. Creighton. Optimal Strategies for Continuous Gravitational Wave Detection in Pulsar Timing Arrays. 756:175, September 2012.

J. A. Ellis, F. A. Jenet, and M. A. McLaughlin. Practical Methods for Continuous Gravitational Wave Detection Using Pulsar Timing Data. 753:96, July 2012.

J. A. Ellis, X. Siemens, and S. Chamberlin. Results of the First IPTA Closed Mock Data Challenge. *arXiv:1210:5274*, October 2012.

J. A. Ellis, M. A. McLaughlin, and J. P. W. Verbiest. The impact of a stochastic gravitational-wave background on pulsar timing parameters. 417:2318–2329, November 2011.

W.S. Przybysz, **J. A. Ellis**, S.C. Thakur, A. Hansen, R.A. Hardin, S. Sears, and E.E. Scime. A magneto-optic probe for magnetic fluctuation measurements. *Rev Sci Instrum*, 80(10):103502, 2009.