

Efstathios (Stathis) D Gennatas, MBBS AICSM PhD

Research Scientist, Stanford University

Machine Learning for Precision Medicine; Biomedical Data Science

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EDUCATION**PhD, Neuroscience****University of Pennsylvania**, 2011 - 2017Thesis: Towards Precision Psychiatry: Gray Matter Development
And Cognition In Adolescence

committee: Ruben C Gur, PhD; Daniel H Wolf, MD PhD;

Geoffrey K Aguirre, MD PhD; Brian B Avants, PhD; Lyle H Ungar, PhD

MBBS* AICSM, Medicine****Imperial College London**, 2002 - 2008**BSc, Biomedical Sciences with Psychology and Psychiatry****Imperial College London**, 2005 - 2006 (intercalated)**PROFESSIONAL EXPERIENCE****Research Scientist****Stanford University**, 10/2019 -Laboratory for Artificial Intelligence in Medicine and Biomedical Physics
Department of Radiation Oncology, School of Medicine**Visiting Research Scientist****University of Pennsylvania**, summer 2019*Expert-Augmented Machine Learning in Medicine*

Perelman School of Medicine

Assistant Professional Researcher**University of California, San Francisco**, 2017 - 2019*Machine Learning for Precision Medicine*

Department of Radiation Oncology, School of Medicine

Assistant Specialist**University of California, San Francisco**, 2008 - 2011*Neuroimaging in neurodegenerative disease*

Memory and Aging Center, Department of Neurology, School of Medicine

PI: William W Seeley

Intern**Stanford University**, summer 2007

Image processing of experimental stimuli

Department of Psychology, School of Humanities and Sciences

*Bachelor of Medicine, Bachelor of Surgery; UK medical degree equivalent to US MD

**Associateship of the Imperial College School of Medicine

TEACHING EXPERIENCE

Guest lecturer

University of California San Francisco, Spring 2019
Biostat 216: Machine Learning in R

Guest lecturer

University of Pennsylvania, Fall 2013 & Spring 2014
PSYC 149/BIBB 249: Cognitive Neuroscience

Teaching Assistant

University of Pennsylvania, Fall 2013
PSYC 149/BIBB 249: Cognitive Neuroscience

COMPUTING SKILLS

R, Python, MATLAB, Bash, HTML, Unix system administration

SOFTWARE AUTHORED

rtemis

Advanced Machine Learning and visualization for all: A framework for ML research, education, and applied data science in R. 80+ supported algorithms for supervised and unsupervised learning - clustering, decomposition, cross-decomposition, classification, regression, survival analysis. Novel algorithms for accurate and interpretable models, representation learning, and multimodal data analysis. Available on GitHub: [egenn/rtemis](https://github.com/egenn/rtemis). Online documentation and vignettes: rtemis.netlify.com

music

Learn and experiment with music theory in R. Build, plot, and play back scales, chords, and chord progressions. Available on [CRAN](https://CRAN.r-project.org/web/packages/music/index.html).
Vignette: github.com/egenn/music

PNC Explorer

Dynamic web app for exploring the full data release of the Philadelphia Neurodevelopmental Cohort. Interactive univariate and bivariate plots, heatmaps, and dynamic tables. Written in **R + shiny**, powered by **rtemis**.

MMP

Multimodal MRI preprocessing pipelines based on ANTs and FSL for structural, functional, and diffusion-weighted imaging. Written in **Bash** to run on Sun / Oracle Grid Engine.

INVITED TALKS

USF Seminar Series in Data Science, University of San Francisco, 2019

We need new Machine Learning for Precision Medicine

Stanford Department of Radiation Oncology, Stanford, 2018

rtemis: Advanced Machine Learning for Precision Medicine made easy

Brain Behavior Lab, University of Pennsylvania, 2018*Accurate and Interpretable Machine Learning for Precision Medicine***Data Institute SF Inaugural Conference, University of San Francisco, 2017***Machine Learning for Precision Medicine: Promises and Challenges***RWTH Aachen University, 2015***Differential age-related effects on human gray matter density and volume in the periadolescent period.***PROFESSIONAL SERVICE**

Program committee DebugML-19: ICLR Workshop on Debugging Machine Learning Models
Journal reviewer NeuroImage, Neurobiology of Aging
Grant reviewer Natural Sciences and Engineering Research Council of Canada (NSERC)

PEER-REVIEWED PUBLICATIONS ([PubMed](#), [Google scholar](#))

Luna JM*, **Gennatas ED***, Eaton E, Diffenderfer E, Ungar LH, Jensen ST, Charles SB II, Friedman JH, Solberg TD, Valdes G. *Building more accurate decision trees with the Additive Tree*. Proc Natl Acad Sci USA 2019

**Equal contribution*

Butler PM, Chiong W, Perry DC, Miller ZA, **Gennatas ED**, Brown JA, Pasquini L, Karydas A, Dokuru D, Coppola G, Sturm VE, Boxer AL, Gorno-Tempini ML, Rosen HJ, Kramer JH, Miller BL, Seeley WW, *Dopamine receptor D4 (DRD4) polymorphisms with reduced functional potency intensify atrophy in syndrome-specific sites of frontotemporal dementia*. NeuroImage: Clinical 2019

Morin O, Chen W, **Gennatas E**, Magill S, Wu A, Valdes G, Perry A, Sneed P, McDermott M, Solberg T, Oberheim Bush NA, Braunstein S, Villanueva-Meyer J, Raleigh D. *Preoperative quantitative imaging features are prognostic for meningioma outcomes*. Neuro-Oncology, Volume 20, Issue suppl_6, 5 November 2018, Pages vi153–vi154

Gennatas ED, Wu A, Braunstein SE, Morin O, Chen WC, Magill ST, Gopinath C, Villanueva-Meyer JE, Perry A, McDermott MW, Solberg TD. *Preoperative and postoperative prediction of long-term meningioma outcomes*. PloS ONE. 2018 Sep 20;13(9):e0204161. (*Featured in Machine Learning in Health and Biomedicine special issue*)

Interian Y, Rideout V, Kearney VP, **Gennatas E**, Morin O, Cheung J, Solberg T, Valdes G. *Deep nets vs expert designed features in medical physics: An IMRT QA case study*. Med Phys. 2018 Mar 30.
 Rosen AFG, Roalf DR, Ruparel K, Blake J, Seelaus K, Villa LP, Ciric R, Cook PA, Davatzikos C, Elliott MA, Garcia de La Garza A, **Gennatas ED**, Quarmley M, Schmitt JE, Shinohara RT, Tisdall MD, Craddock RC, Gur RE, Gur RC, Satterthwaite TD. *Data-driven assessment of structural image quality*. Neuroimage. 2017 Dec 23. pii: S1053-8119(17)31083-2.

Vandekar SN, Shou H, Satterthwaite TD, Shinohara RT, Merikangas AK, Roalf DR, Ruparel K, Rosen A, **Gennatas ED**, Elliott MA, Davatzikos C, Gur RC, Gur RE, Detre JA. *Sex differences in estimated brain*

metabolism in relation to body growth through adolescence. J Cereb Blood Flow Metab. 2017 Jan 1:271678X17737692.

Gennatas ED, Avants BB, Wolf DH, Satterthwaite TD, Ruparel K, Ciric R, Hakonarson H, Gur RE, Gur RC. *Age-related effects and sex differences on gray matter density, volume, mass, and cortical thickness from childhood to young adulthood.* J Neurosci. 2017 Apr 21. pii: 3550-16. (**Featured on the cover and editorial**)

Aguirre GK, Datta R, Benson NC, Prasad S, Jacobson SG, Cideciyan AV, Bridge H, Watkins KE, Butt OH, Dain AS, Brandes L, **Gennatas ED**. *Patterns of Individual Variation in Visual Pathway Structure and Function in the Sighted and Blind.* PLoS ONE. 2016;11(11):e0164677.

Kaczurkin AN, Moore TM, Ruparel K, Ciric R, Calkins ME, Shinohara RT, Elliott MA, Hopson R, Roalf DR, Vandekar SN, **Gennatas ED**, Wolf DH, Scott JC, Pine DS, Leibenluft E, Detre JA, Foa EB, Gur RE, Gur RC, Satterthwaite TD. *Elevated Amygdala Perfusion Mediates Developmental Sex Differences in Trait Anxiety.* Biol Psychiatry. 2016;80(10):775-785.

Shanmugan S, Wolf DH, Calkins ME, Moore TM, Ruparel K, Hopson RD, Vandekar SN, Roalf DR, Elliott MA, Jackson C, **Gennatas ED**, Leibenluft E, Pine DS, Shinohara RT, Hakonarson H, Gur RC, Gur RE, Satterthwaite TD. *Common and Dissociable Mechanisms of Executive System Dysfunction Across Psychiatric Disorders in Youth.* Am J Psychiatry. 2016;173(5):517-526.

Guo CC, Sturm VE, Zhou J, **Gennatas ED**, Trujillo AJ, Hua AY, Crawford R, Stables L, Kramer JH, Rankin K, Levenson RW, Rosen HJ, Miller BL, Seeley WW. *Dominant hemisphere lateralization of cortical parasympathetic control as revealed by frontotemporal dementia.* Proc Natl Acad Sci USA. 2016;113(17):E2430-E2439.

Roalf DR, Quarmley M, Elliott MA, Satterthwaite TD, Vandekar SN, Ruparel K, **Gennatas ED**, Calkins ME, Moore TM, Hopson R, Prabhakaran K, Jackson CT, Verma R, Hakonarson H, Gur RC, Gur RE. *The impact of quality assurance assessment on diffusion tensor imaging outcomes in a large-scale population-based cohort.* Neuroimage. 2016;125:903-919.

Satterthwaite TD, Vandekar SN, Wolf DH, Bassett DS, Ruparel K, Shehzad Z, Craddock RC, Shinohara RT, Moore TM, **Gennatas ED**, Jackson C, Roalf DR, Milham MP, Calkins ME, Hakonarson H, Gur RC, Gur RE. *Connectome-wide network analysis of youth with Psychosis-Spectrum symptoms.* Mol Psychiatry. 2015; 20(12):1508-1515.

Satterthwaite TD, Wolf DH, Roalf DR, Ruparel K, Erus G, Vandekar S, **Gennatas ED**, Elliott MA, Smith A, Hakonarson H, Verma R, Davatzikos C, Gur RE, Gur RC. *Linked Sex Differences in Cognition and Functional Connectivity in Youth.* Cerebral Cortex. 2015;25(9):2383-2394.

Satterthwaite TD, Shinohara RT, Wolf DH, Hopson RD, Elliott MA, Vandekar SN, Ruparel K, Calkins ME, Roalf DR, **Gennatas ED**, Jackson C, Erus G, Prabhakaran K, Davatzikos C, Detre JA, Hakonarson H, Gur RC, Gur RE. *Impact of puberty on the evolution of cerebral perfusion during adolescence.* Proc Natl Acad Sci USA. 2014;111(23):8643-8648.

Satterthwaite TD, Wolf DH, Ruparel K, Erus G, Elliott MA, Eickhoff SB, **Gennatas ED**, Jackson C, Prabhakaran K, Smith A, Hakonarson H, Verma R, Davatzikos C, Gur RE, Gur RC. *Heterogeneous*

impact of motion on fundamental patterns of developmental changes in functional connectivity during youth. Neuroimage. 2013;83:45-57.

Satterthwaite TD, Wolf DH, Erus G, Ruparel K, Elliott MA, **Gennatas ED**, Hopson R, Jackson C, Prabhakaran K, Bilker WB, Calkins ME, Loughead J, Smith A, Roalf DR, Hakonarson H, Verma R, Davatzikos C, Gur RC, Gur RE. *Functional maturation of the executive system during adolescence.* J Neurosci. 2013;33(41):16249-16261.

Gardner RC, Boxer AL, Trujillo A, Mirsky JB, Guo CC, **Gennatas ED**, Heuer HW, Fine E, Zhou J, Kramer JH, Miller BL, Seeley WW. *Intrinsic connectivity network disruption in progressive supranuclear palsy.* Ann Neurol. 2013;73(5):603-616.

Gennatas ED, Cholfin JA, Zhou J, Crawford RK, Sasaki DA, Karydas A, Boxer AL, Bonasera SJ, Rankin KP, Gorno-Tempini ML, Rosen HJ, Kramer JH, Weiner M, Miller BL, Seeley WW. *COMT Val158Met genotype influences neurodegeneration within dopamine-innervated brain structures.* Neurology. 2012;78(21):1663-1669.

Zhou J, **Gennatas ED**, Kramer JH, Miller BL, Seeley WW. *Predicting regional neurodegeneration from the healthy brain functional connectome.* Neuron. 2012;73(6):1216-1227.

Rohrer JD, Geser F, Zhou J, **Gennatas ED**, Sidhu M, Trojanowski JQ, Dearmond SJ, Miller BL, Seeley WW. *TDP-43 subtypes are associated with distinct atrophy patterns in frontotemporal dementia.* Neurology. 2010;75(24):2204-2211.

Zielinski BA, **Gennatas ED**, Zhou J, Seeley WW. *Network-level structural covariance in the developing brain.* Proc Natl Acad Sci USA. 2010;107(42):18191-18196.

Zhou J, Greicius MD, **Gennatas ED**, Growdon ME, Jang JY, Rabinovici GD, Kramer JH, Weiner M, Miller BL, Seeley WW. *Divergent network connectivity changes in behavioural variant frontotemporal dementia and Alzheimer's disease.* Brain. 2010;133(Pt 5):1352-1367.

PREPRINTS (not otherwise published)

Gur RC, Moore TM, Rosen AFG, Ruparel K, Satterthwaite TD, Roalf DR, **Gennatas ED**, Bilker WB, Shinohara RT, Port A, Elliott MA, Verma R, Davatzikos C, Wolf DH, Detre JA, Gur RE. *Multimodal parameters of brain structure and function related to sex differences in cognitive performance.* bioRxiv 2019; 659193.

Gennatas ED, Friedman JH, Ungar LH, Pirracchio R, Eaton E, Reichman L, Interian Y, Simone CB, Auerbach A, Delgado E, Van der Laan MJ, Solberg TD, Valdes G. *Expert-Augmented Machine Learning.* arXiv:1903.09731 2019

Luna JM, Eaton E, Ungar LH, Diffenderfer E, Jensen ST, **Gennatas ED**, Wirth M, Charles SB, Solberg TD, Valdes G *Tree-Structured Boosting: Connections Between Gradient Boosted Stumps and Full Decision Trees* arXiv:1711.06793 2017

MANUSCRIPTS UNDER REVIEW

Gennatas ED, Friedman JH, Ungar LH, Pirracchio R, Eaton E, Reichman L, Interian Y, Simone CB, Auerbach A, Delgado E, Van der Laan MJ, Solberg TD, Valdes G. *Expert-Augmented Machine Learning*

MANUSCRIPTS IN PREPARATION

Valdes G, Friedman JH, **Gennatas ED**. *Representational Gradient Boosting*. 2019

BIOMEDICAL CONFERENCE ABSTRACTS (selection)

Gennatas ED, Wu A, Braunstein SE, Morin O, Chen WC, Magill ST, Gopinath C, Villanueva-Meyer JE, Perry A, McDermott MW, Solberg TD. *Pre- and postoperative prediction of long-term meningioma outcomes*. American Society for Radiation Oncology 2018

Morin O, Chen WC, Villanueva-Meyer J, **Gennatas ED**, Wu A, Cha A, Magill A, Perry A, Sneed PK, McDermott MW, Solberg TD, Valdes G, Braunstein SE, Raleigh D. *Point-of-Care Local Failure and Overall Survival Prediction Models for Meningioma*. American Society for Radiation Oncology 2018

Witztum A, **Gennatas E**, Valdes G, Solberg T, Raleigh D, Morin O. *Assessing the Influence of Imaging Parameters and Contouring on Meningioma Local Failure Prediction Models*. The American Association of Physicists in Medicine 2018 Annual Meeting

Gennatas E, Morin O, Braunstein S, Solberg T, Valdes G, Raleigh D. *Preoperative Prediction of Local Failure and Overall Survival for Meningioma* European Society for Radiotherapy & Oncology 2018

Gennatas ED, Avants BB, Wolf DH, Ruparel K, Hakonarson H, Gur RE, Gur RC. *Differential age-related effects on human gray matter density and volume in the periadolescent period*. Annual Meeting of the Organization for Human Brain Mapping, 2015

Gennatas ED, Satterthwaite TD, Wolf DH, Ruparel K, Vandekar S, Hakonarson H, Gur RE, Gur RC. *Developmental trajectories of gray matter density from childhood to young adulthood*. Society for Neuroscience Annual Meeting, 2014 - **Selected for Neuroscience 2014 Hot Topics**

Datta R, Benson N, Daina A, **Gennatas ED**, Prasad S, Butt O, and Aguirre GK. *A Single Mode Of Brain Alteration In Blindness. A Multimodal MR Imaging Study*. Annual Meeting of the American Academy of Neurology, 2014

Datta R, Daina AB, Brandes L, **Gennatas ED**, Prasad S, Butt OH, Aguirre GK. *Blindness produces yoked changes in V1 cortical thickness, cross-modal responses, and resting metabolism*. Visual Science Society Annual Meeting, 2013

Gardner R, Boxer A, Trujillo A, Mirsky J, Guo C, **Gennatas ED**, Heuer H, Fine E, Zhou J, Kramer J, Miller B, and Seeley WW. *Intrinsic Connectivity Network Disruption in Progressive Supranuclear Palsy*. Annual Meeting of the American Academy of Neurology, 2013

Guo C, Sturm VE, Zhou J, Trujillo A, **Gennatas ED**, Miller BL, & Seeley WW. *Autonomic dysregulation at baseline in neurodegenerative diseases*. International conference on frontotemporal dementias, 2012
Zielinski BA, **Gennatas ED**, Zhou J, & Seeley WW. *Structural covariance networks in adolescents and young adults*. Annual Child Neurology Society Meeting, 2011

Zhou J, **Gennatas ED**, Kramer JH, Miller BL, Seeley WW. *Critical network epicenters and connectivity-based-vulnerability in neurodegeneration*. Annual Meeting of the Organization for Human Brain Mapping, 2011 and International conference on frontotemporal dementias, 2010

Gennatas ED, Cholfin JA, Zhou J, Crawford RK, Sasaki D, Karydas A, Miller DL, Seeley WW. *COMT Val158Met genotype influences dopamine-innervated brain structure volume in neurodegenerative disease*. International conference on frontotemporal dementias, 2010

Zhou J, Greicius MD, **Gennatas ED**, Growdon ME, Jang JY, Rabinovici GD, Kramer JH, Weiner M, Miller BL, Seeley WW. *Divergent network connectivity changes in behavioral variant frontotemporal dementia and Alzheimer's disease*. Annual Meeting of the American Academy of Neurology, 2010

Gennatas ED, Zhou J, Kramer JH, Miller BL, Seeley WW. *The salience network divided: processing and responding to emotional relevance*. Annual Meeting of the Organization for Human Brain Mapping, 2010

Zhou J, Rankin KP, **Gennatas ED**, Kramer JH, Miller BL, Seeley WW. *Individual differences in human empathy relate to intrinsic connectivity network patterns*. Annual Meeting of the Organization for Human Brain Mapping, 2010

Zielinski BA, **Gennatas ED**, Zhou J, Seeley WW. *Network-level structural covariance in the developing brain*. Annual Meeting of the Organization for Human Brain Mapping, 2009

COMPUTER SCIENCE CONFERENCE PAPERS

Gennatas ED, Interian Y, Solberg TD, Van der Laan MJ, Valdes G. *Conditionally Interpretable SuperLearner*. Neural Information Processing Systems 2018

Luna JM, Eaton E, Ungar LH, Diffenderfer E, Jensen ST, **Gennatas ED**, Wirth M, Charles SB, Solberg TD, Valdes G. *Tree-Structured Boosting: Connections Between Gradient Boosted Stumps and Full Decision Trees* arXiv:1711.06793. Neural Information Processing Systems 2017 Symposium on Interpretable Machine Learning