

Farrukh Nauman

farrukhnauman@gmail.com | (+46) 0702984959 | LinkedIn: [fnauman](#) | Github: [fnauman](#)
Krokslättsparkgata 18B LGH 1202, 43168 Mölndal (Sweden)

Job Objective: Seeking a full-time position as a data scientist.

SKILLS

- **Languages:** Python, C, Fortran **Technologies:** GitHub, Bitbucket
- **Machine Learning Libraries:** SCIKIT-LEARN, TENSORFLOW/KERAS, STATSMODELS, PYSPARK
- **Computational Fluid Dynamics:** ATHENA, SNOOPY, PLUTO, PENCIL, SHENFUN
- **Modeling:** (Current) Using machine and deep learning to construct surrogate models of high fidelity simulations of astrophysical fluids.
(Previous) Theoretical and classical numerical models for astrophysical fluids.

EXPERIENCE

- (Current) Chalmers University of Technology** Gothenburg, Sweden
Origins Fellow (Machine Learning, Astrophysical Fluid Modeling) Sep 2018 - Present
- **Machine Learning models of dynamos (1+ years, one paper accepted in Astronomy & Astrophysics):** (github.com/fnauman/ML_alpha2):
 - * Designed and setup 10+ high resolution simulations of forced helical magnetohydrodynamic turbulence (FORTRAN).
 - * Lasso, Random Forests (SCIKIT-LEARN), Randomized Lasso (SCIKIT-LEARN-CONTRIB), Bayesian MCMC (EMCEE).
 - * Feature selection using model ensembling/stacking.
 - * Lasso performed the best since the data was low dimensional with high signal to noise ratio.
 - **GlobalDisks:** Used a grid-based code PLUTO (written in C) to setup plasma simulations of astrophysical disks around massive stars.
- Niels Bohr Institute** Copenhagen, Denmark
Postdoctoral Fellow (Astrophysical Fluid Modeling) Sep 2015 - Sep 2018
- **LocalDisks:** Setup a pseudospectral fluid code SNOOPY (written in C) to setup simulations of astrophysical accretion flows.
 - **TransitionToTurbulence:** Highlighted the importance of aspect ratio of simulation domains in the transition to turbulence.

MACHINE LEARNING PROJECTS

- **Time series:** My experience in modeling highly non-linear physical systems (turbulence) has introduced me to a wide variety of algorithms (github.com/fnauman/timeseries):
 - **Deep learning (TENSORFLOW):** CNNs, RNNs, LSTMs, wavenet.
 - **Machine learning (SKLEARN):** Lasso, Random forests, XGBOOST.
 - **Econometrics (STATSMODELS):** Seasonal Autoregressive Integrated Moving Average.
 - **Dynamical systems (NUMPY, SCIPY, SKLEARN):** SINDy algorithm for *identifying differential equations* (can be used for forecasting).
- **Package for SCIKIT-LEARN models:** (github.com/fnauman/template_travis_sklearn):
 - Modular design: preprocessing, training, testing of SCIKIT-LEARN models.
 - CONTINUOUS INTEGRATION, UNIT TESTING.
 - LOGGING, versioning to address reproducibility.
 - Packaging: Python package installation through requirements.txt.
- **API (FLASK) for SCIKIT-LEARN models inside a DOCKER container:** (github.com/fnauman/flask_api_for_sklearn_docker):
- **PYSPARK, SCIKIT-LEARN, DASK_ML applied to the iris dataset:** (https://github.com/fnauman/pyspark_models):

EDUCATION

- University of Rochester** Rochester, New York (USA)
PhD in Physics and Astronomy (Advisor: Eric G. Blackman) Oct 2015
- Thesis:** Turbulence in Rotating and Non-Rotating Magnetohydrodynamic Shear Flows.
- Quaid-i-Azam University** Islamabad, Pakistan
M. Phil. Physics June 2009
- Thesis:** Modified gravity as an explanation for cosmic acceleration.

AWARDS AND & ACHIEVEMENTS

- HPC-Europa3 travel+computing: (i) NORDITA (March-April 2018: Stockholm, Sweden), (ii) ZARM (March 2019: Bremen, Germany).
- Horton fellowship from Laboratory for Laser Energetics. 2010-2015
- Susumu Okubo Prize for the highest performance on the graduate physics written comprehensive exam and excellence in coursework. 2011

REFEREING SERVICE FOR JOURNALS

Monthly Notices of Royal Astronomical Society, Journal of Cosmology and Astrophysics, Astrophysical Journal, European Physical Journal Plus

PUBLICATIONS (RECENT)

- **Farrukh Nauman**, Joonas Nättilä. 2019. *Exploring helical dynamos using machine learning*. accepted by Astronomy and Astrophysics (arxiv.org/abs/1905.08193)
- **Farrukh Nauman**, Martin E. Pessah. 2018. *Transport properties of Keplerian flows in extended domains with no imposed field*. MNRAS, 480, 204.
- **Farrukh Nauman**, Eric G. Blackman. 2017. *Shearing box simulations in the Rayleigh unstable regime*. MNRAS, 467, 1652, (arxiv.org/abs/1507.04711)
- **Farrukh Nauman**, Eric G. Blackman. 2017. *Sustained turbulence and magnetic energy in non-rotating shear flows*. Phys. Rev. E, 95, 033202, (arxiv.org/abs/1701.03531)

SELECTED TALKS & POSTERS

- Machine learning and dynamos
Star and Planet Formation, Chalmers Gothenburg, Sweden, June 17th-20th, 2019.
- Using machine learning to model astrophysical flows
Advancing AI, CHAIR (Chalmers) Gothenburg, Sweden, March 4-5th, 2019
- Energy transfers in turbulent MHD shear flows
ZARM, University of Bremen, Germany. July 25th, 2018
- Magnetized accretion disks
Chalmers, Sweden. May 23rd, 2018