Giovanni Fossati, Ph.D.

fossatig@gmail.com
pedrosan.github.io
+1-832-875-9408

Ph.D., Astrophysics
Int'l School for Advanced Studies, Trieste (Italy)

5200 Weslayan St. A313
Houston, TX

Profile

- ⊞ Scientist with 10+ years research experience in astrophysics on the faculty at a top-tier university actively seeking opportunities in *data science* to apply to real-world challenges my skills, talent and passion for data-driven quantitative analysis, modeling and interpretation.
- ⊞ Open-minded inquisitive problem-solver who dealt with broadly defined issues, analyzing, understanding, disaggregating them, identifying their core, and devising effective and practical approaches to solve them.
- ⊞ Defined and lead projects from raw data to results and communication. Able to keep the big picture perspective while zooming on the details, a strength nurtured by the experience leading and coordinating work with collaborators and students. Adept at interacting effectively with theorist, observers, and programmers.
- ⊞ Effective communicator, able to understand and engage with a wide variety of audiences, thanks to vast experience with collaborative work and delivering talks and lectures, from classrooms to international conferences.

Research Experience

- Made ***influential*** contributions to advancing the understanding of Active Galactic Nuclei (AGN), the most luminous objects in the universe, powered by gas accretion onto supermassive black holes at the center of galaxies.
- Worked on problems of different nature (e.g., time variability, population statistics, physics modeling), attacked with a multi-pronged approach encompassing theory, simulations and observations. Strived to create data-driven simulations, folding-in real-world effects to be able to compare models directly with data.
- Top-notch ***astrophysics research*** has many ***parallels*** with the best ***data science***, for it requires (and develops):
  - ▷ independence
  - ▷ curiosity and skepticism
  - ▷ creativity / innovation
  - ▷ deductive reasoning (hypothesis-testing)
  - ▷ inductive reasoning (discovery)
  - ▷ *back-of-the-envelope* / heuristic reasoning
  - ▷ adaptability
  - ▷ perseverance
  - ▷ will / ability to learn

  and to exercise them in a quantitative scientific context, supported by strong computing, mathematics, statistics skills.
- ***Hands-on experience*** on all aspects of a diverse workflow closely aligned with that of data science.
  - ▷ Distill problems into good questions. Frame and structure them into projects.
  - ▷ Identify and collect the required data, from multiple sources. Clean, integrate them.
  - ▷ Multivariate data, often incomplete and biased, and requiring context-specific knowledge.
  - ▷ Exploratory analysis, largely visualization-driven, interrogating the data about the story they are telling.
  - ▷ Design and develop data analysis and modeling methods and codes. Simulations of empirical and physical models.
  - ▷ Interpretation, hypothesis-testing, predictions.
  - ▷ Reporting, dissemination (papers, talks.)
- My research followed two main themes, briefly summarized here highlighting some methods and major results:
  - ▷ To identify and validate the fundamental laws underlying the phenomenology of AGNs.
    - ◦ Populations studies: statistical analysis and modeling of multivariate properties of observed samples of objects, accompanied by population-synthesis simulations.
    - ◦ ***Discovered*** global unifying property and formulated the *"power sequence"* hypothesis that transformed our understanding of these objects, laying the foundation of a new paradigm and leading subsequent major advancements.
  - ▷ To understand the nature of cosmic jets, by characterizing their physical conditions and their variations.
    - ◦ Multivariate variability studies of individual bright sources: multi-wavelength observations (time-series analysis) and simulations of time-dependent emission models.
    - ◦ ***First realistic simulations*** of variable radiative emission from AGN jets, achieved by developing a state-of-the-art code combining Monte Carlo and Fokker-Planck methods.
- **Accomplishments / Impact**:
  - ▷ Author of over 100 scientific ***publications***, with 4,500+ ***citations***, *h-index* of 29 [↬ `@myPapers`]
  - ▷ Two papers among the most ***highly cited*** of the last 20 years in the field (top 10 of 5,200+) [↬ `@top10field`]
  - ▷ Awarded more than 1 Million USD from highly competitive ***NASA grants***.
  - ▷ Research results included in undergraduate and graduate astronomy ***textbooks***.

Related Professional Experience

Presentations • Given talks at over 60 International Conferences and Universities.

Teaching • Taught for 10 years undergraduate and graduate courses at one of most selective US universities. Full responsibility for planning/preparing/delivering lectures, material, assessment.

Scientific writing (and reviewing) • Grant proposals (*NASA*, *National Science Foundation*) – Telescope-time proposals (*NASA*, *ESA*) – Peer-reviewed articles in all major professional journals.

Committees • Served on Department and University Committees, involved with faculty hiring, curriculum development, strategic planning and definition of policies and procedures.

Research mentoring • two Ph.D. students and several undergraduate students.

Project management • Lead collaborative projects from inception to completion. Defined: scope, milestones, goals – Formulated suitable plan (data, modeling), within resource constraints – Executed/supervised/coordinated: analysis, interpretation, predictions, communication of results.

Technical Skills

Eclectic and flexible: the result of "organic growth" driven by evolving need and curiosity (scientific and technical).

Developed / worked with • Large simulation codes for empirical and physical models, also based on Monte Carlo method. – Data analysis pipelines – Quick iteration, fluid, command-line / scripting magic – Applications for higher level analysis, statistical computing, and visualization (mostly with `R`).

Programming • Advanced : `R` – `perl` – `Fortran` – `awk` – `linux shell` – several astronomy packages.
Worked with : `python` – `C` – `MySQL` – `IDL` – `MatLab` – `Tcl` – `git`

Statistical Learning • regression: linear, non-linear, logistic – PCA – kNN – SVM – clustering – k-means – decision trees – random forest – some NLP work

Publishing • LaTeX – `knitr` – `Shiny` – `Open/LibreOffice` – `HTML` – `CSS` – `(R)markdown` – MS Office.

Employment

Rice University (Houston)	Research Scientist	2014 – now
Rice University (Houston)	Assistant Professor	2004 – 2014
European Southern Observatory (Chile)	Visiting Scientist	2009 (8–12)
Rice University (Houston)	Faculty Fellow	2001 – 2004
Univ. of California, San Diego	*CASS* Postdoctoral Fellow	1998 – 2001

Education and Training

Ph.D.	**Astrophysics**	International School for Advanced Studies (Trieste, Italy)	1998
Laurea (M.Sc.)	Physics	Università degli Studi di Milano (Milano, Italy)	1994

- Strengthened ***data science skills*** via *MOOCs* (66 weeks total):
  - ▷ Coursera : *Johns Hopkins Bloomberg School of Public Health – Data Science Specialization*
    - ∘ The Data Scientist's Toolbox
    - ∘ R Programming
    - ∘ Getting and Cleaning Data
    - ∘ Data Science Capstone Project (NLP)
    - ∘ Exploratory Data Analysis
    - ∘ Reproducible Research
    - ∘ Statistical Inference
    - ∘ Regression Models
    - ∘ Practical Machine Learning
    - ∘ Developing Data Products
  - ▷ Coursera : *Stanford*
    - ∘ Machine Learning
  - ▷ edX : *CalTech*
    - ∘ Learning From Data
  - ▷ edX : *MIT*
    - ∘ The Analytics Edge

Additional Personal Information

Citizenship • **USA** / Italy / Switzerland ☞ **Open to relocation**

Languages • Italian (mother tongue) / English (fluent) /
Spanish (good verbal and reading, fair writing) / French (fair)