Francesco Guarneri

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Research Interest

High redshift QSO - QSO surveys - High resolution spectroscopy of QSO

Education

Nov. 2020 – Nov 2023 – **PhD – *Cum laude***
University of Trieste, European Southern Observatory

- *PhD project title*: Science with ESPRESSO
- *Supervisors*: Prof. Dr. Stefano Cristiani, Dr. Luca Pasquini

2018 – 2020 – **Master degree in Physics, 110/110 Cum Laude**
University of Trieste, dept. of Physics

- *Thesis title*: A machine learning approach to a wide-angle selection of bright, high-redshift QSOs: the QUBRICS survey
- *Supervisors*: prof. Cristiani Stefano, Dr. Giorgio Calderone

2015 – 2018 – **Bachelor degree in Physics, 110/110 Cum Laude**
University of Trieste, dept. of Physics

- *Thesis title*: Study of the population of GRBs detectable from the South site of CTA
- *Supervisors*: prof. Longo Francesco, Dr. Gasparetto Thomas

Employment history

Apr. 2024 – Mar. 2027 – **Postdoctoral researcher**, Hamburg Observatory
Supermassive black holes in the Early Universe

Publications (First author)

- **QUBRICS Lenses - Searching for lensed QSO using Gaia**
  Submitted to A&A
- **Fundamental physics with ESPRESSO: a new determination of the D/H ratio towards PKS1937-101**
  Accepted for publication in MNRAS, arxiv.org/abs/2402.05586
- **The probabilistic random forest applied to the QUBRICS survey: improving the selection of high-redshift quasars with synthetic data**
  2022 MNRAS, 517, 2436
- **The Probabilistic Random Forest applied to the selection of quasar candidates in the QUBRICS Survey**
  2021 MNRAS, 506, 2471

A complete list of publications is available at the end of the CV or online at NASA/ADS and https://g-francio.github.io/.

Successful Telescope Proposals (PI and selected CoI)

- **PI – ESO NTT** – Period P108 (delegated visitor), P109 (visitor), P110 (visitor), P111 (delegated to CoIs), P112 (delegated visitor), P113 (planned, delegated to CoIs, support as delegated visitor)
  4 nights each – Spectroscopic confirmation of high redshift QSO candidates.
- **PI – TNG** – AOT43, AOT44, AOT45, AOT46, AOT48, AOT49
  1 to 4 nights each, service mode – Spectroscopic confirmation of high redshift QSO candidates.
- **CoI – ESO ESPRESSO** P112, ESPRESSO Large Program (EQUALS)
  From the intergalactic to the interstellar scales - a high resolution legacy survey of gaseous reservoirs using ESPRESSO
- **CoI – ESO ESPRESSO** P110, P111, P112, P113
  An ESPRESSO Redshift Drift Experiment

Studentship and awards

- 2022 – 2023 – **ESO Studentship** – Garching bei München, Germany
- 2015, 2019, 2021 – **Premio allo studio BCC Agrobresciano**, Brescia, Italy
- 2015 – **MIUR Eccellenze Esami di Stato a.s. 2014/2015**, Cremona, Italy

Programming experience

- **Languages**: Python, Julia (good knowledge); SQL, Bash (basic)
- **Data reduction**: PypeIt, ESO DRS (ESPRESSO)
- **Machine learning**: (Probabilistic) Random Forest, Clustering algorithm (bases of), Neural networks (bases of)
- **Editing/version control**: VS Code, Git, Latex
- **Other**: Cloudy, Jupyter Notebooks, Topcat

Language skills

- **Italian**: Mother tongue
- **English**: Fluent
- **German**: Basic (A1.1)
- **French**: Basic (A2, former B2)

Conferences, schools and talks

Conferences

- Sept. 2023 – Contributed talk at the Spectral Fidelity workshop (Florence, Italy)
  A new measurement of the primordial deuterium abundance with ESPRESSO
- July. 2023 – Invited talk at StEm65 (Stexten, Italy)
  A new measurement of the primordial deuterium abundance with ESPRESSO
- Feb. 2023 – Contributed (remote) talk at ESPRESSO face-to-face meeting (Lanzarote, Spain)
  Measuring the primordial abundance of Deuterium with ESPRESSO
- Jun. 2022 – Poster at Hack 100 conference (Trieste, Italy)
  Re-measuring the primordial deuterium abundance toward PKS1937-101 with ESPRESSO
- May 2022 – Poster at SciOPS workshop (Garching bei München, Germany)
  QUBRICS: machine learning for searching bright, high-redshift quasars
- Oct. 2021 – Contributed talk at IAP Colloquim 2021 (Paris, France)
  Machine learning: lessons learnt with the QUBRICS survey

Schools

- Jun. 2023 – Vatican Observatory Summer School – Learning the Universe, Data Science Tools for Astronomical Surveys, Castel Gandolfo, Italy
- Sept. 2021 – 4th Azores School on Observational Cosmology, Angra do Heroísmo, Açores, Portugal

Community service

- 2023 – **LOC member** – Spectral Fidelity workshop
- 2023 – **Schülerpraktikum supervisor**
- 2022, 2023 – **ESO Journal Club Organiser**
- 2022, 2023 – **ESO Scientific Assistant** for proposal evaluation – P110, P112
- 2021 – **Mentoring**, General physics for bachelor's degree in biological sciences and technologies (Trieste)

Outreach

- 2023 – **Universe on Tour**
- 2022, 2023 – **ESO Supernova** – Tour guide for Italian groups
- 2015 – **La Matematica tra le mani** – Tour guide and Co-Organiser

Publication list

Guarneri Francesco

Refereed publications

[1] **Guarneri, F.**, Pasquini, L., D'Odorico, V., Cristiani, S., Cupani, G., Di Marcantonio, P., Hernández, J. I. G., Martins, C. J. A. P., Mascareño, A. S., Milaković, D., Molaro, P., Murphy, M. T., Nunes, N. J., Palle, E., Pepe, F., Rebolo, R., Santos, N. C., Santos, R. G., Schmidt, T. M., Sousa, S. G., Sozzetti, A., Trost, A., *Fundamental physics with ESPRESSO: a new determination of the D/H ratio towards PKS1937-101*. In: MNRAS, 2024. arXiv: 2402.05586 [astro-ph.CO].

[2] **Guarneri, F.**, Calderone, G., Cristiani, S., Porru, M., Fontanot, F., Boutsia, K., Cupani, G., Grazian, A., D'Odorico, V., Murphy, M. T., Bongiorno, A., Saccheo, I., Nicastro, L., *The probabilistic random forest applied to the QUBRICS survey: improving the selection of high-redshift quasars with synthetic data*. In: MNRAS 517.2, 2022, pp. 2436–2453. arXiv: 2209.07257 [astro-ph.IM].

[3] **Guarneri, F.**, Calderone, G., Cristiani, S., Fontanot, F., Boutsia, K., Cupani, G., Grazian, A., D'Odorico, V., *The probabilistic random forest applied to the selection of quasar candidates in the QUBRICS survey*. In: MNRAS 506.2, 2021, pp. 2471–2481. arXiv: 2106.12990 [astro-ph.IM].

[4] Cristiani, S., Cupani, G., Trost, A., D'Odorico, V., **Guarneri, F.**, Lo Curto, G., Meneghetti, M., Di Marcantonio, P., Faria, J. P., González Hernández, J. I., Lovis, C., Martins, C. J. A. P., Milaković, D., Molaro, P., Murphy, M. T., Nunes, N. J., Pepe, F., Rebolo, R., Santos, N. C., Schmidt, T. M., Sousa, S. G., Sozzetti, A., Zapatero Osorio, M. R., *Probing the small-scale structure of the intergalactic medium with ESPRESSO: spectroscopy of the lensed QSO UM673*. In: MNRAS 528.4, 2024, pp. 6845–6860. arXiv: 2402.05896 [astro-ph.CO].

[5] Calderone, G., **Guarneri, F.**, Porru, M., Cristiani, S., Grazian, A., Nicastro, L., Bischetti, M., Boutsia, K., Cupani, G., D'Odorico, V., Feruglio, C., Fontanot, F., *Boost recall in QSO selection from highly imbalanced photometric datasets*. In: arXiv e-prints, arXiv:2312.13194, 2023, arXiv:2312.13194. arXiv: 2312.13194 [astro-ph.IM].

[6] Grazian, A., Boutsia, K., Giallongo, E., Cristiani, S., Fontanot, F., Bischetti, M., Bongiorno, A., Calderone, G., Cupani, G., D'Odorico, V., Feruglio, C., Fiore, F., **Guarneri, F.**, Porru, M., Saccheo, I., *Crossing the Rubicon of Reionization with z 5 QSOs*. In: ApJ 955.1, 60, 2023, p. 60. arXiv: 2307.12421 [astro-ph.GA].

[7] Cristiani, S., Porru, M., **Guarneri, F.**, Calderone, G., Boutsia, K., Grazian, A., Cupani, G., D'Odorico, V., Fontanot, F., Martins, C. J. A. P., Marques, C. M. J., Maitra, S., Trost, A., *Spectroscopy of QUBRICS quasar candidates: 1672 new redshifts and a golden sample for the Sandage test of the redshift drift*. In: MNRAS 522.2, 2023, pp. 2019–2028. arXiv: 2304.00362 [astro-ph.CO].

[8] Fontanot, F., Cristiani, S., Grazian, A., Haardt, F., D'Odorico, V., Boutsia, K., Calderone, G., Cupani, G., **Guarneri, F.**, Fiorin, C., Rodighiero, G., *Eddington accreting black holes in the epoch of reionization*. In: MNRAS 520.1, 2023, pp. 740–749. arXiv: 2301.07129 [astro-ph.CO].

[9] Cupani, G., Calderone, G., Selvelli, P., Cristiani, S., Boutsia, K., Grazian, A., Fontanot, F., **Guarneri, F.**, D'Odorico, V., Giallongo, E., Menci, N., *Near-infrared spectroscopy of extreme BAL QSOs from the QUBRICS bright quasar survey*. In: MNRAS 510.2, 2022, pp. 2509–2528. arXiv: 2112.02594 [astro-ph.CO].

[10] Grazian, A., Giallongo, E., Boutsia, K., Calderone, G., Cristiani, S., Cupani, G., Fontanot, F., **Guarneri, F.**, Ozdalkiran, Y., *The Space Density of Ultra-luminous QSOs at the End of Reionization Epoch by the QUBRICS Survey and the AGN Contribution to the Hydrogen Ionizing Background*. In: ApJ 924.2, 62, 2022, p. 62. arXiv: 2110.13736 [astro-ph.GA].

[11] Boutsia, K., Grazian, A., Fontanot, F., Giallongo, E., Menci, N., Calderone, G., Cristiani, S., D'Odorico, V., Cupani, G., **Guarneri, F.**, Omizzolo, A., *The Luminosity Function of Bright QSOs at $z \sim 4$ and Implications for the Cosmic Ionizing Background*. In: ApJ 912.2, 111, 2021, p. 111. arXiv: 2103.10446 [astro-ph.GA].

[12] Boutsia, K., Grazian, A., Calderone, G., Cristiani, S., Cupani, G., **Guarneri, F.**, Fontanot, F., Amorin, R., D'Odorico, V., Giallongo, E., Salvato, M., Omizzolo, A., Romano, M., Menci, N., *The Spectroscopic Follow-up of the QUBRICS Bright Quasar Survey*. In: ApJS 250.2, 26, 2020, p. 26. arXiv: 2008.03865 [astro-ph.GA].

Non-Refereed publications, posters and proceedings

[13] Cristiani, S., Boutsia, K., Calderone, G., Cupani, G., D'Odorico, V., Fontanot, F., Grazian, A., **Guarneri, F.**, Martins, C., Pasquini, L., Porru, M., Vanzella, E., *Spectrographs and Spectroscopists for the Sandage Test*. In: arXiv e-prints, arXiv:2302.04365, 2023, arXiv:2302.04365. arXiv: 2302.04365 [astro-ph.CO].

[14] **Guarneri, F.**, Cristiani, S., Calderone, G., Boutsia, K., Grazian, A., Cupani, G., Fontanot, F., D'Odorico, V., Porru, M., *QUBRICS: machine learning for searching bright, high-redshift quasars*. In: SciOps 2022: Artificial Intelligence for Science and Operations in Astronomy (SCIOPS). Proceedings of the ESA/ESO SCOPS Workshop held 16-20 May. 2022, 34, p. 34.

[15] Boutsia, K., Grazian, A., Cristiani, S., Calderone, G., **Guarneri, F.**, Cupani, F., Fontanot, F., D'Odorico, V., *The QUBRICS Survey*. In: Joint Observatories Kavli Science Forum in Chile (joksfic2022). Proceedings of the conference held 25-29 April. 2022, 8, p. 8.

[16] Cupani, G., Calderone, G., Cristiani, S., **Guarneri, F.,** *Advanced Data Analysis for Observational Cosmology: applications to the study of the Intergalactic Medium*. In: arXiv e-prints, arXiv:2305.10182, 2023, arXiv:2305.10182. arXiv: 2305.10182 [astro-ph.IM].