



Elena Cuoco

Elena Cuoco's curriculum vitae et studiorum

Employment History

- March 2018–present **Secondment @Scuola Normale Superiore**, *Scuola Normale Superiore*,
Piazza dei Cavalieri, 7, 56126 Pisa (PI), ITALY.
Member of EGO@SNS group
(<https://www.sns.it>)
- 2014–present **EGO directorate member**, *European Gravitational Observatory*,
Via Amaldi 1, S. Stefano a Macerata, Cascina (PI), ITALY.
Data scientist for Virgo experiment
(www.virgo-gw.eu)
- Feb 2014–Jan 2018 **GraWIToN Scientific Coordinator**, *European Gravitational Observatory*,
Via Amaldi 1, S. Stefano a Macerata, Cascina (PI), ITALY.
GraWIToN
FP7 ITN
- 2004–present **Physicist**, *European Gravitational Observatory*,
Via Amaldi 1, S. Stefano a Macerata, Cascina (PI), ITALY.
Applied physicist for Virgo experiment
- 2004–present **Research Associate**, *Istituto di Fisica Nucleare*, Pisa, ITALY.
Virgo experiment
- 2001–2004 **Researcher**, *Istituto di Fisica Nucleare*, Firenze, ITALY.
Virgo experiment
- 1999–2001 **Postdoctoral Fellow**, *Osservatorio Astronomico di Arcetri*, Firenze, ITALY.
Virgo experiment

National Academic Qualification as Associate Professor, MIUR

- 2014-2020 "*Professore seconda Fascia, Settore Concorsuale 02/A1 - II Fascia Decorso il termine di pubblicazione degli atti ai sensi dell'art. 8, comma 9, del DPR n. 222 del 2011*"

External collaboration

- 17th until 19th of January 2017 **Short term Visiting scientist**, *Physics and Astronomy Department*, Glasgow University, UK.
- March 2016 **Short term Visiting scientist**, *Department of Astronomy and Astrophysics*, Valencia University, ES.

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ResearcherID Lab: Cuoco, Elena Dr. (I-8789-2012)

15th of June until the 8th of July 2016 **Short term Visiting scientist**, *Physics and Astronomy Department*, Glasgow University, UK.

11th to 21st of August 2014 **Short term Visiting scientist**, *Physics and Astronomy Department*, Glasgow University, UK.
(SUPA Distinguished Visitors)

Education

1994–1997 **PhD, Physics**, *University of Pisa*, Pisa, PI, ITALY.

Thesis title: "Identificazione dello spettro di rumore di Virgo e metodi di rivelazione dei segnali gravitazionali"

Advisers: Giuseppe Curci

1986–1993 **Master Degree, Physics**, *University of Pisa*, Pisa, ITALY.

Thesis title: "Problemi Statistici nello studio della struttura su grande scala dell'Universo"

Advisers: P. Policchi (Pisa University), L. Moscardini (Bologna University)

Research Interests

Virgo Data Analysis

Virgo Data Analysis for detector characterization I developed algorithms, tools and software to monitor spectral lines in Virgo data and to adaptively remove them. I worked on data analysis for detector characterization, with parametric spectral estimation, adaptive filtering and whitening filters. I was coordinator of Virgo noise analysis group from 2008 to 2014, leading a group of more than 10 researchers.

Virgo Data Analysis for Transient analysis I completely setup a new pipeline for event trigger generator for transient signal based on wavelet decomposition, the Wavelet Detection Filter (WDF). This filter was used during C7 commissioning run in Virgo to find coincidence with Gamma Ray Burst events.

Virgo Data Analysis software My contribution include the development of library for data preprocessing, for whitening and signal processing. I was the coordinator and developer of the Noise Analysis Package (NAP) for Virgo, a C++ library embedded in python which includes algorithms for data characterization. I worked on the implementation of the noise monitoring system in Virgo, to monitor in time the status and the data quality of Virgo acquired data (NMAPI). I implemented Wavelet detection filter in C++ with python interface.

Machine Learning

Algorithm for Transient Signal Classification Since 2014 I started working on Machine Learning pipelines with the goal of automatizing the classification for noise transient signals. I contributed to the setting up of a LIGO Virgo common working group on machine learning and I'm the Virgo chair for Machine Learning group in LIGO/Virgo Collaboration

Teaching Experience

- The Second Virgo EGO Scientific Forum School on Gravitational Wave Data Analysis, 2th-6th May 2011, EGO. Lectures on Fundamentals of noise characterization Spectral and time frequency analysis Noise estimation and modeling

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- The First Virgo EGO Scientific Forum School on Gravitational Wave Data Analysis, February 10th -13th 2010, EGO. Lectures on Fundamentals of noise characterization Spectral and time frequency analysis Noise estimation and modeling
- Lecture on Machine Learning for Gravitational Wave. 22th 12 2017 Gravitational Waves course at Roma II (Tor Vergata) University, Roma

Invited talk

- Connection the Dots 2018 Workshop (20-22 March 2018)
- Second ASTERICS-OBELICS Workshop (16-19 October 2017)
- SIGRAV 2016 Cefalù, Italy, (12-18 September 2016)
- Gravitational Waves parallel session in MG11 2006, MG12 2009
- Summer School "Harmonic analysis and rational approximation", 2003
- Several outreach talks

Awards

- As a member of LSC-Virgo: SPECIAL BREAKTHROUGH PRIZE IN FUNDAMENTAL PHYSICS

Students & Thesis

- Supervisor/External Referee for 2 PhD students
- Several summer students at European Gravitational Observatory

Participation to European projects

- Asterics-Obelics (<https://www.asterics2020.eu/>)
- Scientific Coordinator at GraWIToN, FP7-ITN project (<http://www.grawiton-gw.eu/>)
- ET design study (<http://www.et-gw.eu/>)
- ILIAS, CORDIS-FP6 (<http://www.ego-gw.it/ILIAS-GW/>)

Conferences organizations

Workshop Organizer and Scientific Committee	1st Workshop: Theory and Applications of Signal Processing Methods in Gravitational Waves Detection, Medical Science and Engineering
Organizer and chair	1st basic GraWIToN school and 2nd GraWIToN school
Scientific Committee	GraWIToN schools
Scientific Committee	SIGRAV 2016

Professional service

Virgo Continuous Waves Pipelines Review Team member

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IOP Referee
SIGRAV Member of Scientific Board
Scientific outreach for EGO in 2010 and for EGO/Virgo in 2015
coordinator


Certificates

- MAS.S69x Big Data and Social Physics
- CS1156x Learning From Data (introductory Machine Learning course) edX Honor Code Certificate
- 6.00.1x: Introduction to Computer Science and Programming Using Python, edX Verified Certificate
- 6.00.2x Introduction to Computational Thinking and Data Science, edX Verified Certificate
- CS105x: Introduction to Apache Spark, edX Verified Certificate
- Neural Networks and Deep Learning by deeplearning.ai on Coursera. Certificate earned at Tuesday, November 28, 2017 3:53 PM GMT
- Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization by deeplearning.ai on Coursera. Certificate earned at Saturday, December 16, 2017 9:13 AM GMT
- Structuring Machine Learning Projects by deeplearning.ai on Coursera. Certificate earned at Wednesday, January 17, 2018 2:37 PM GMT
- Convolutional Neural Networks by deeplearning.ai on Coursera. Certificate earned at Friday, February 23, 2018 4:12 PM GMT

Language Skills


English Proficient
French Basic

Significant Publications (Updated at October 2017)







- GLITCHES CLASSIFICATION Jade Powell¹, Daniele Trifiró, Elena Cuoco, Ik Siong Heng and Marco Cavagliá: Classification methods for noise transients in advanced gravitational-wave detectors, *Classical and Quantum Gravity* **32** (2015)  doi:<https://doi.org/10.1088/0264-9381/32/21/215012>
- Powell, Jade; Torres-Forné, Alejandro; Lynch, Ryan; Trifiró, Daniele; Cuoco, Elena; Cavagliá, Marco; Heng, Ik Siong; Font, José A: Classification methods for noise transients in advanced gravitational-wave detectors II: performance tests on Advanced LIGO data, *Class. Quant. Grav.*, **34** (2017)
- GAMMA RAY BURST AND WDF F Acernese... A Corsi...E Cuoco...et al, Gravitational waves by gamma-ray bursts and the Virgo detector: the case of GRB 050915a Journal Article *Classical and Quantum Gravity* **24** (2007)
- WHITENING FILTER Cuoco, Elena; Losurdo, Giovanni; Calamai, Giovanni; Fabbroni, Leonardo; Mazzoni, Massimo; Stanga, Ruggero; Guidi, Gianluca; Vetrano, Flavio: Noise parametric identification and whitening for LIGO 40-meter interferometer data Journal Article *Phys. Rev., D* **64** (2001)

Cuoco, Elena; Fabbri, Leonardo; Mazzoni, Massimo; Stanga, Ruggero; Calamai, Giovanni; Losurdo, Giovanni; Vetrano, Flavio: On line power spectra identification and whitening for the noise in interferometric gravitational wave detectors, *Class. Quant. Grav.*, **18** (2001)

NEWTONIAN NOISE G. Cella, E. Cuoco et al., Relevance of Newtonian seismic noise for the VIRGO interferometer sensitivity *Class. Quant. Grav.*, **15** (1998)

h-index  (Google Scholar): 65 (Web of Science): 52

Publications

- [1] Effects of data quality vetoes on a search for compact binary coalescences in advanced ligo's first observing run. 2017.
- [2] Benjamin P Abbott and others". Gw170814: A three-detector observation of gravitational waves from a binary black hole coalescence. *Phys. Rev. Lett.*, 119(14):141101, 2017.  doi:10.1103/PhysRevLett.119.141101.
- [3] Benjamin P Abbott and others". First search for nontensorial gravitational waves from known pulsars. 2017.
- [4] First search for nontensorial gravitational waves from known pulsars. 2017.
- [5] Benjamin P Abbott and others". Gw170814: A three-detector observation of gravitational waves from a binary black hole coalescence. *Submitted to: Phys. Rev. Lett.*, 2017.
- [6] Upper limits on gravitational waves from scorpius x-1 from a model-based cross-correlation search in advanced ligo data. 847(1):47, 2017.  doi:10.3847/1538-4357/aa86f0.
- [7] Search for high-energy neutrinos from gravitational wave event gw151226 and candidate lvt151012 with antares and icecube. *Phys. Rev.*, D96(2):022005, 2017.  doi:10.1103/PhysRevD.96.022005.
- [8] S Abdollahi and others". Search for cosmic-ray electron and positron anisotropies with seven years of fermi large area telescope data. *Phys. Rev. Lett.*, 118(9):091103, 2017.  doi:10.1103/PhysRevLett.118.091103.
- [9] B P Abbott and others". Search for gravitational waves associated with gamma-ray bursts during the first advanced ligo observing run and implications for the origin of grb 150906b. *Astrophys. J.*, 841(2):89, 2017.  doi:10.3847/1538-4357/aa6c47.
- [10] Jade Powell, Alejandro Torres-Forn'e, Ryan Lynch, Daniele Trifirò, Elena Cuoco, Marco Cavagli"à, Ik Siang Heng, and Jos'e A Font. Classification methods for noise transients in advanced gravitational-wave detectors ii: performance tests on advanced ligo data. *Class. Quant. Grav.*, 34(3):034002, 2017.  doi:10.1088/1361-6382/34/3/034002.
- [11] J L Racusin et al. Searching the gamma-ray sky for counterparts to gravitational wave sources: Fermi gamma-ray burst monitor and large area telescope observations of lvt151012 and gw151226. *Astrophys. J.*, 835(1):82, 2017.  doi:10.3847/1538-4357/835/1/82.

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









- [12] A gravitational-wave standard siren measurement of the hubble constant. 2017. [doi:10.1038/nature24471](https://doi.org/10.1038/nature24471).
- [13] B P Abbott and others". Estimating the contribution of dynamical ejecta in the kilonova associated with gw170817. 2017.
- [14] B P Abbott and others". On the progenitor of binary neutron star merger gw170817. 2017.
- [15] Search for high-energy neutrinos from binary neutron star merger gw170817 with antares, icecube, and the pierre auger observatory. 2017.
- [16] B P Abbott and others". Gw170817: Implications for the stochastic gravitational-wave background from compact binary coalescences. 2017.
- [17] First narrow-band search for continuous gravitational waves from known pulsars in advanced detector data. *Submitted to: Phys. Rev. D*, 2017.
- [18] High-energy neutrino follow-up search of gravitational wave event gw150914 with antares and icecube. *Phys. Rev.*, D93(12):122010, 2016. [doi:10.1103/PhysRevD.93.122010](https://doi.org/10.1103/PhysRevD.93.122010).
- [19] B P Abbott and others". Binary black hole mergers in the first advanced ligo observing run. *Phys. Rev.*, X6(4):041015, 2016. [doi:10.1103/PhysRevX.6.041015](https://doi.org/10.1103/PhysRevX.6.041015).
- [20] B P Abbott and others". Gw151226: Observation of gravitational waves from a 22-solar-mass binary black hole coalescence. *Phys. Rev. Lett.*, 116(24):241103, 2016. [doi:10.1103/PhysRevLett.116.241103](https://doi.org/10.1103/PhysRevLett.116.241103).
- [21] B P Abbott and others". Supplement: The rate of binary black hole mergers inferred from advanced ligo observations surrounding gw150914. 227(2):14, 2016. [doi:10.3847/0067-0049/227/2/14](https://doi.org/10.3847/0067-0049/227/2/14).
- [22] B P Abbott and others". Directly comparing gw150914 with numerical solutions of einstein's equations for binary black hole coalescence. *Phys. Rev.*, D94(6):064035, 2016. [doi:10.1103/PhysRevD.94.064035](https://doi.org/10.1103/PhysRevD.94.064035).
- [23] B. P. Abbott et al. An improved analysis of gw150914 using a fully spin-precessing waveform model. 2016.
- [24] B P Abbott and others". Comprehensive all-sky search for periodic gravitational waves in the sixth science run ligo data. *Phys. Rev.*, D94(4):042002, 2016. [doi:10.1103/PhysRevD.94.042002](https://doi.org/10.1103/PhysRevD.94.042002).
- [25] B P Abbott and others". A first targeted search for gravitational-wave bursts from core-collapse supernovae in data of first-generation laser interferometer detectors. *Phys. Rev.*, D94(10):102001, 2016. [doi:10.1103/PhysRevD.94.102001](https://doi.org/10.1103/PhysRevD.94.102001).
- [26] B P Abbott and others". Search for transient gravitational waves in coincidence with short-duration radio transients during 2007–2013. *Phys. Rev.*, D93(12):122008, 2016. [doi:10.1103/PhysRevD.93.122008](https://doi.org/10.1103/PhysRevD.93.122008).
- [27] B P Abbott and others". Supplement: Localization and broadband follow-up of the gravitational-wave transient gw150914. *Astrophys. J. Suppl.*, 225(1):8, 2016. [doi:10.3847/0067-0049/225/1/8](https://doi.org/10.3847/0067-0049/225/1/8).

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- [28] B P Abbott and others". Localization and broadband follow-up of the gravitational-wave transient gw150914. *Astrophys. J.*, 826(1):L13, 2016.  doi:10.3847/2041-8205/826/1/L13.
- [29] S. Adrian-Martinez et al. High-energy neutrino follow-up search of gravitational wave event gw150914 with antares and icecube. *Phys. Rev.*, D93(12):122010, 2016.  doi:10.1103/PhysRevD.93.122010.
- [30] B P Abbott and others". Tests of general relativity with gw150914. *Phys. Rev. Lett.*, 116(22):221101, 2016.  doi:10.1103/PhysRevLett.116.221101.
- [31] B P Abbott and others". Gw150914: Implications for the stochastic gravitational wave background from binary black holes. *Phys. Rev. Lett.*, 116(13):131102, 2016.  doi:10.1103/PhysRevLett.116.131102.
- [32] B P Abbott and others". Astrophysical implications of the binary black-hole merger gw150914. *Astrophys. J.*, 818(2):L22, 2016.  doi:10.3847/2041-8205/818/2/L22.
- [33] B P Abbott and others". Characterization of transient noise in advanced ligo relevant to gravitational wave signal gw150914. *Class. Quant. Grav.*, 33(13):134001, 2016.  doi:10.1088/0264-9381/33/13/134001.
- [34] B P Abbott and others". Observing gravitational-wave transient gw150914 with minimal assumptions. *Phys. Rev.*, D93(12):122004, 2016.  doi:10.1103/PhysRevD.94.069903, 10.1103/PhysRevD.93.122004. [Addendum: *Phys. Rev.* D94,no.6,069903(2016)].
- [35] B P Abbott and others". The rate of binary black hole mergers inferred from advanced ligo observations surrounding gw150914. *Astrophys. J.*, 833(1):L1, 2016.  doi:10.3847/2041-8205/833/1/L1.
- [36] B P Abbott and others". Properties of the binary black hole merger gw150914. *Phys. Rev. Lett.*, 116(24):241102, 2016.  doi:10.1103/PhysRevLett.116.241102.
- [37] B P Abbott and others". Gw150914: First results from the search for binary black hole coalescence with advanced ligo. *Phys. Rev.*, D93(12):122003, 2016.  doi:10.1103/PhysRevD.93.122003.
- [38] B P Abbott and others". Gw150914: The advanced ligo detectors in the era of first discoveries. *Phys. Rev. Lett.*, 116(13):131103, 2016.  doi:10.1103/PhysRevLett.116.131103.
- [39] B P Abbott and others". Observation of gravitational waves from a binary black hole merger. *Phys. Rev. Lett.*, 116(6):061102, 2016.  doi:10.1103/PhysRevLett.116.061102.
- [40] B P Abbott and others". All-sky search for long-duration gravitational wave transients with initial ligo. *Phys. Rev.*, D93(4):042005, 2016.  doi:10.1103/PhysRevD.93.042005.
- [41] First low frequency all-sky search for continuous gravitational wave signals. *Phys. Rev.*, D93(4):042007, 2016.  doi:10.1103/PhysRevD.93.042007.

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












- [42] J Äasi and others". Search of the orion spur for continuous gravitational waves using a loosely coherent algorithm on data from ligo interferometers. *Phys. Rev.*, D93(4):042006, 2016.  doi:10.1103/PhysRevD.93.042006.
- [43] T Äccadia and others". Advanced virgo interferometer: a second generation detector for gravitational waves observation. In *Proceedings, 16th Lomonosov Conference on Elementary Particle Physics: Particle Physics at the Year of Centenary of Bruno Pontecorvo: Moscow, Russia, August 22-28, 2013*, pages 261–270, 2015.
- [44] Jade Powell, Daniele Trifirò, Elena Cuoco, Ik Siong Heng, and Marco Cavaglià. Classification methods for noise transients in advanced gravitational-wave detectors. *Class. Quant. Grav.*, 32(21):215012, 2015.  doi:10.1088/0264-9381/32/21/215012.
- [45] Gravitational waves: search results, data analysis and parameter estimation. *Gen. Rel. Grav.*, 47(2):11, 2015.  doi:10.1007/s10714-014-1796-x.
- [46] J Äasi and others". Searches for continuous gravitational waves from nine young supernova remnants. *Ästrophys. J.*, 813(1):39, 2015.  doi:10.1088/0004-637X/813/1/39.
- [47] J Äasi and others". Directed search for gravitational waves from scorpius x-1 with initial ligo data. *Phys. Rev.*, D91(6):062008, 2015.  doi:10.1103/PhysRevD.91.062008.
- [48] J Äasi and others". Narrow-band search of continuous gravitational-wave signals from crab and vela pulsars in virgo vsr4 data. *Phys. Rev.*, D91(2):022004, 2015.  doi:10.1103/PhysRevD.91.022004.
- [49] J Äasi and others". Characterization of the ligo detectors during their sixth science run. *Class. Quant. Grav.*, 32(11):115012, 2015.  doi:10.1088/0264-9381/32/11/115012.
- [50] J Äasi and others". Searching for stochastic gravitational waves using data from the two colocated ligo hanford detectors. *Phys. Rev.*, D91(2):022003, 2015.  doi:10.1103/PhysRevD.91.022003.
- [51] F Äcernese and others". Advanced virgo: a second-generation interferometric gravitational wave detector. *Class. Quant. Grav.*, 32(2):024001, 2015.  doi:10.1088/0264-9381/32/2/024001.
- [52] Multimessenger search for sources of gravitational waves and high-energy neutrinos: Initial results for ligo-virgo and icecube. *Phys. Rev.*, D90(10):102002, 2014.  doi:10.1103/PhysRevD.90.102002.
- [53] J Äasi and others". Improved upper limits on the stochastic gravitational-wave background from 2009–2010 ligo and virgo data. *Phys. Rev. Lett.*, 113(23):231101, 2014.  doi:10.1103/PhysRevLett.113.231101.
- [54] J Äasi and others". First all-sky search for continuous gravitational waves from unknown sources in binary systems. *Phys. Rev.*, D90(6):062010, 2014.  doi:10.1103/PhysRevD.90.062010.

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














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












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






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