

## CURRICULUM VITAE OF DIEGO FAZI

### Contact Information

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### Education

**University of Bologna**, Bologna (Italy) (In-residence at the **California Institute of Technology**)

**Ph.D. in Physics**. Awarded on: April 28th 2009

Major: Theoretical Physics and Mathematical Methods.

Thesis subject: Gravitational Waves Data Analysis and General Relativity.

Dissertation Title: “*Development of a physical-template search for gravitational waves from spinning compact-object binaries with LIGO.*”

**University of Bologna**, Bologna (Italy)

**M.S. (laurea) in Physics** – 110/110 Summa Cum Laude. Awarded on: March 12th 2004

Major: Nuclear and Subnuclear Physics.

Thesis subject: General Relativity and Quantum Field Theory.

Dissertation Title: “*Gravitational collapse of a radiating shell composed of charged bosonic matter*”  
(original title in Italian)

### Fellowships and Awards

- Grant for an allocation of 764,640 CPU hours on Northwestern's "Quest High Performance Computing System" as PI of a project for gravitational-wave data analysis and simulations (01/17/2012).
- Honorable mention for the 2009 GWIC Thesis Prize ([gwic.ligo.org/thesisprize/2009/](http://gwic.ligo.org/thesisprize/2009/))
- Italian Government Graduate Fellowship 2005-2008
- LIGO-Caltech fellowship 2005-2008
- Caltech-TAPIR fellowship 2008-2009

### Schools and Courses Attended

- “Workshop on Life Cycle Analysis of Energy Systems using the GREET Model”, at The University of Chicago, Gleacher Center, Chicago, IL - May 18, 2012
- “2012 Northwestern Workshop on Challenges for Electricity Markets” at Kellogg School of Management, Northwestern University, Evanston, IL - May 4-5, 2012
- “Workshop on Energy and Environmental Systems Analysis using Agent-Based Modeling” at The

University of Chicago, Gleacher Center, Chicago, IL - February 24, 2012

- “Petscale Programming Environments and Tools On-site” at Virtual School of Computational Science and Engineering, Northwestern University, Evanston, IL - July 6–9, 2010
- VESF “School for Gravitational Waves” at “EGO gravitational observatory”, Cascina (Italy), May 22-26, 2006

## Research Experience

### **Argonne National Laboratory and ANSER, Lemont, IL**

Post-doctoral Appointee in the Solar Conversion group, 2012 - present

- I use Markov-Chain Monte Carlo techniques coupled with Pair Distribution Function analysis to compare experimental high-energy X-ray scattering data with theoretical models of water-splitting solar photocatalysts, with the goal of characterizing the catalysts' molecular structure and improving the efficiency of hydrogen production from artificial photosynthesis.

### **LIGO Scientific Collaboration (LSC)**

Performed research as a member of the Laser Interferometer Gravitational-wave Observatory (LIGO) and LIGO Scientific Collaboration (LSC) at various institutions, 2005 - present

### **Northwestern University and CIERA, Evanston, IL**

Post-doctoral Fellow in Astrophysics, 2009 - 2012

- Developed a new data analysis strategy for the search of GWs emitted by stellar compact-object binaries, using matched-filtering techniques. Paper in preparation (see publications)
- Contributed developing a Markov Chain - Monte Carlo (MCMC) Bayesian code for parameter estimation of astrophysical GW sources

### **California Institute of Technology, Pasadena, CA**

Post-doctoral fellow in Physics, July-August 2009

Visitor in Physics, 2005-2009

- Studied, developed and implemented all the code for a new search of GWs emitted by spinning compact-object binaries using precessing GW templates

### **University of Bologna, Bologna (Italy)**

MS and PhD student, 2003-2005

- Studied the gravitational collapse of self-gravitating bodies in curved space-times and the associated quantum-mechanical radiation emission. Subject of my MS thesis.
- Results following this study lead also to the publication of a paper (see publications)

## Selected Talks and Poster Presentations

- “Evidence for Spin in Compact Binary Coalescence: when can we trust it?”, AAS Meeting, Austin - January 8th, 2012
- “Re-Purposed MCMC for Low-Latency Sky Localization of Gravitational Wave Sources”, AAS Meeting, Austin, TX - January 8th, 2012
- “Development of a search for gravitational waves from spinning compact-object binaries with ground-based interferometers”, Midwest Relativity Meeting, University of Illinois, Urbana Champaign, IL - November 4th 2011

- “A data-analysis pipeline deploying Physical Single-Spin Templates in the Search for Gravitational Waves from Spinning Compact-Object Binaries with LIGO.”, GWPAW conference, UWM - January 26th, 2011
- “Physical Templates in the Search for Gravitational Waves from Spinning Compact-Object Binaries with LIGO”, GWDAW Conference 2010, University “La Sapienza” (Italy) - January 27th, 2010
- “Investigating the benefits of using the PTF spinning search”, Amaldi8, Columbia U, June 21, 2009
- “Searching for gravitational waves from spinning binaries in LIGO data using a Physical Template family” at the “Pacific Coast Gravity Meeting”, UC Santa Barbara - March 22nd, 2008

## Invited Talks

- “From Gravitational Waves to Solar Fuels: Data Analysis Techniques.”, Argonne National Laboratory, June 15<sup>th</sup>, 2012
- “Physical Templates in the Search for Gravitational Waves from Spinning Compact-Object Binaries with LIGO”, EGO Seminar, Virgo Site, Cascina (Italy), January 20th, 2010
- “Search for gravitational waves from spinning binaries in LIGO data using a new family of Physical Templates”, University of Bologna (Italy) - January 15th, 2008
- “LIGO and the search for gravitational waves from spinning binaries”, University of Bologna (Italy) - January 11th, 2007

## Leadership Experience

### LIGO-Virgo Compact Binary Coalescence (CBC) group:

- Head of the project for the search of GWs from spinning compact-object binaries, 2007-2012
- Coordinator of the Spinning Binaries sub-group within the CBC, 2009-2012

### Extra Activities:

- Founder, Manager and Web Designer/Administrator of the website [www.earthome.net](http://www.earthome.net) , October 2010 - present
- Local coordinator and organizer at Green Drinks International for events in Evanston, IL (<http://greendrinksevanston.wordpress.com/>), May 2011 - September 2012
- Member of Board of Directors at Citizens’ Greener Evanston (<http://greenerivanston.org/>), November 2010 - September 2012

## Outreach

- **Roosevelt Elementary School Science Fair** , December 2nd, 2011 (Chicago, IL): hosted the interactive booth “Exoplanets: Could there be other habitable worlds out there?”
- **Premio della Critica Cinematografica e Televisiva** , July 3rd, 2011 (Fabriano, Italy): contributed with a personal video about my personal experience as a research scientist living abroad
- Interviewed by **Medill Reports Chicago** , February 17th, 2011 (Chicago, IL): released an interview about the Nature article “Twisting of light around rotating black holes”
- Interviewed by local newspaper “**L’azione**” , December 5th, 2009 (Fabriano, Italy): released an interview about my research on gravitational waves and its impact on science and everyday life

## Professional Affiliations

- American Physical Society, 2007-present

- LIGO-Virgo Scientific Collaboration (LVC), 2005-present

### **Technical Skills and Research Expertise**

- Code development in Ansi C and Matlab, python scripting
- Theoretical and computational modeling
- Matched filtering techniques for data analysis
- Signal Processing, Fourier Transforms, Spectral Analysis
- Markov-Chain Monte-Carlo Bayesian methods for parameter estimation
- Cluster computing, Petascale and parallel computing, high performance code optimization
- Scientific Computing: Matlab, Mathematica
- Mean-field quantum approaches to classical systems
- Dynamics of Compact-Object Binaries and gravitational radiation emission
- Post-Newtonian General Relativity and GWs modeling
- Gravitational-wave Data Analysis and Theory
- Semiclassical General Relativity and Quantum Field Theory in curved spacetimes