ELENA MOROTTI

Research fellow at Dipartimento di Informatica - Scienza e
Ingegneria, Università di Bologna, Italy.
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RESEARCH INTEREST

My research concerns Virtual Reality applications.
I am also interested in numerical methods for the regularization and the resolution of inverse
problems, deriving from tomographic medical imaging systems.

EDUCATION

January 2014 - January 2018	**Phd in Computational Mathematics** University of Padua, Italy Supervised by Professor Elena Loli Piccolomini

Project:
My doctoral research focuses on the study and the application of
optimization algorithms for the reconstruction of 3D medical breast
images from few tomographic real data. Mathematically, the breast
tomosynthesis problem is an underdetermined linear system of huge
size and it is solved with a regularization item. A good solver must be
able to reduce CT artifacts and also feasible to be implemented in
parallel on commercial softwares. I am writing a commercial-like
program, running on GPUs, to test first-order methods on real data.

Thesis:
Title: "Reconstruction of 3D X-ray tomographic images from sparse
data with TV-based methods"
Submission: 28th October 2017
Discussed: 1st March 2018

Maternity leave: July - December 2014

February 2013	**Master degree in Applied Mathematics** 110/110 cum laude Mathematics Department, University of Bologna, Italy. **Thesis title:** "Tecniche di regolarizzazione per analisi perfusionali da immagini tomografiche" ("Regularization techniques for perfusion analysis from

tomographic images")
Supervised by Professor Elena Loli Piccolomini .

October 2010	**Bachelor degree in Mathematics** 110/110 Mathematics Department, University of Bologna, Italy. **Thesis title:** "Metodi numerici per la segmentazione di immagini digitali" Supervised by Professor Elena Loli Piccolomini
June 2007	**Scientific high school degree** 100/100 Liceo Scientifico Statale Rambaldi-Valeriani, Imola, BO, Italy.

WORK EXPERIENCE

February 2013 - February 2014	Analyst programmer IMS S.r.l - Internazionale Medico Scientifica (http://www.imsitaly.eu) Sasso Marconi, BO,Italy. **Project:** research, development and test of algorithms to implement 3D-mammographic instruments, through the solution of linear system with regularization techniques.
February - March 2018	Collaboration with the Department of Computer Science and Engineering, University of Bologna, Italy. **Project:** "Sviluppo e implementazione di algoritmi efficienti per la ricostruzione di immagini, nell'ambito del Progetto di realizzazione di ambienti di realtà virtuale e realtà aumentata immersiva".
May 2018 - present	Research fellow Department of Computer Science and Engineering, University of Bologna, Italy. **Project:** "Sviluppo e implementazione di algoritmi efficienti per la ricostruzione di immagini e realizzazione di applicazioni di realtà virtuale immersiva".

TEACHING EXPERIENCE

Spring 2013	Teaching assistant for the course "Numeri primi e crittografia", funded by "Progetto Lauree Scientifiche", for high schools. University of Bologna, Italy.

A.Y. 2013/2014	Correlator for the Master thesis in Numerical Analysis "Algoritmi di Regolarizzazione con Variazione Totale nella Ricostruzione di Immagini di Tomosintesi", by Lucia Traini. University of Bologna, Italy.
A.Y. 2015/2016	Teaching assistant for the course "Numerical methods" at the International Master Course in Civil Engineering. University of Bologna, Italy.
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A.Y. 2017/2018	Teaching assistant for the course "Numerical methods" at the International Master Course in Civil Engineering. University of Bologna, Italy.
A.Y. 2017/2018	Correlator for the Master thesis in Numerical Analysis "Algoritmi per la ricostruzione di immagini 3D di tomografia ad angoli limitati", by Silvia De Angelis. University of Bologna, Italy.
A.Y. 2017/2018	Contract Professor at Mathematics Department, University of Bologna, Italy.

SKILLS

Programming Languages	C, C#, Matlab, Mathematica, Unity 3d
Operating system	Windows, Linux
Languages	English, basic spoken French
Miscellaneous	Project management, Team coordination, Software development, Data Analysis, Problem Solving

INTERESTS

Sports	Athletics, CrossFit, hiking.
Hobbies	Photo and video editing, sewing.

PUBBLICATIONS

Published:
- E. Loli Piccolomini, E. Morotti, *"A fast Total Variation-based iterative algorithm for digital breast tomosynthesis image reconstruction"*; Journal of Algorithms and Computational Technology, 2016, 10 277-289
- E. Loli Piccolomini, V. L. Coli, E. Morotti, L. Zanni, *"A fast gradient projection method for 3D image reconstruction from limited tomographic data"*; Physics: Conference Series
- E. Loli Piccolomini, V. L. Coli, E. Morotti, L. Zanni, *"Reconstruction of 3D X-rays CT images from reduced sampling by a scaled gradient projection algorithm"*; Computational Optimization and Applications.

CONFERENCES AND COURSES ATTENDED

- 2-13 Sept 2013, *"22nd Summer School on Parallel Computing"*, CINECA, Bologna, Italy.
  (http://www.hpc.cineca.it/content/22summer-parallel-computing-school)

- 5-6 May 2014, *"Introduction to Scientific and Technical Computing in C"*, CINECA, Milano Segrate, Italy.
  (http://www.hpc.cineca.it/content/introduction-to-c)

- 3-5 June 2015, Workshop *"Calcolo scientifico e modelli matematici: alla ricerca delle cose nascoste attraverso le cose manifeste"*, Mathematics Department, University of Genova.
  (http://mida.dima.unige.it/webconference/index.html)

- 15-16 June 2015, PhD course *"Introduction to GPUs and Parallel Computing"* held by Prof. Jacopo Pantaleoni, NVIDIA Research, at the Mathematics Department, University of Padova, Italy.
  (http://www.math.unipd.it/~dottmath/corsi2015/Pantaleoni.pdf)

- 17-18 Sept 2015, Workshop *"Recent Developments in Inverse Problems"*, Weierstrass Institute, Berlin, Germany.
  Contributed talk: "Total Variation regularization algorithms for limited angle tomography reconstruction"
  (https://www.wias-berlin.de/workshops/IPworkshop/)

- 18-20 Jan 2016, PhD course *"Variational methods for Imaging"* held by proff. Valeria Ruggiero and Luca Zanni, at Department of Mathematics, University of Ferrara, Italy.
  (http://dmi.unife.it/en/ph-d-course-in-mathematics-and-computer-science/new_phd/teaching/ferrara/courses/variational-methods-for-imaging)

- 6-8 April 2016, Workshop *"High-Definition Tomo Days"*, Technical University of Denmark, Lyngby, Denmark.
  Poster: "Variational models for Digital Breast Tomosynthesis"

(http://hd-tomo-days.compute.dtu.dk/)

- 15 June 2016, seminar series of *"Seminario Dottorato 2015-2016"*, Mathematics Department, University of Padova.
  Contributed talk: "Computed Tomography: a real case example of inverse problem" (http://dottorato.math.unipd.it/sites/default/files/SemDott1516_note.pdf)

- 19-21 Sept 2016, Workshop *"Optimization Techniques for Inverse Problems III"*, University of Modena, Italy.
  Poster: "Total Variation regularization algorithms for tomosynthesis imaging" (http://www.oip2016.unimore.it/site/home.html)

- 9-13 Jan 2017, Training School *"Scientific Computing for X-Ray Computed Tomography - Algebraic Iterative Reconstruction Methods"*, Technical University of Denmark, Lyngby, Denmark.
  (http://www2.compute.dtu.dk/~pcha/HDtomo/SCforCT.html)

- Jan 2017, visiting student at the Finnish Inverse Problem Society, at the Department of Mathematics and Statistics, University of Helsinki, under the scientific supervision of prof. Samuli Siltanen.
  Invited talk: "Digital breast tomosynthesis: a 3d medical example of sparse tomography", at the Inverse problems seminar series, University of Helsinki.
  (https://www.fips.fi/)

- 6-10 Feb 2017, Workshop *"MATHTECH - A place where mathematics,clinics, and industry meet Biomedical Imaging"*, Indam Institute, Rome, Italy.
  (http://congressi.iac.cnr.it/mathtech-ibm2017)

- 6-7 March 2017, *"Mathematical Methods for Digital Image Analysis and Processing"*, Villa Toeplitz in Varese, University of Insubria, Italy.
  Poster: "Total Variation regularization algorithms for sparse tomography imaging from real data"
  (http://www.rism.it/rism_-_workshop_miap_38.html)

- 12 May 2017, "7th International Conference on New Computational Methods for Inverse Problems", Institute Ferma, Ecole normale supérieure Paris-Saclay, France.
  Contributed talk: "A fast gradient projection method for 3D image reconstruction from limited tomographic data"
  (http://complement.farman.ens-cachan.fr/NCMIP_2017.html)