

## Experience

### **Image Processing,**

- *General image processing, including grayscale, color, infrared, and depth image processing.*
- *Image processing for robotics applications, including pose estimation, camera calibration, and stereo processing.*
- *Bilateral and trilateral filtering for the purposes of noise removal and interpolation.*

### **Photogrammetry,**

- *Fiducial-based pose estimation, including utilizing available technologies such as ARToolKit and ARTag, as well as designing in-house solutions.*
- *NIR-domain tracking for the purpose of sub-millimeter and sub-degree 6 DoF pose estimation.*

### **Medical Image Processing,**

- *DICOM import and processing.*
- *Geometric modeling of organs using MRI slices.*
- *Sterile-field processing for the purpose of surgical navigation.*

### **Optimization,**

- *Inverse problem-based parameter estimation using least mean square and Levenberg–Marquardt minimization.*
- *Stochastic optimization in the presence of outliers using RANSAC and robustified cost minimization.*
- *Fuzzy modeling of multi-layer systems, especially within the field of pattern recognition, using Bayesian models.*

### **Machine Vision,**

- *3D object detection using mono and stereo camera systems.*
- *3D Object pose estimation using low and high level features and training data collected on real or CAD data.*
- *Bin picking using a robotic arm.*
- *Visual inspection of output of printing processes as well as fidelity of manufactured parts.*

### **Range-Data Processing,**

- *Data acquisition and calibration of depth sensors, including stereo, structured light and Time of Flight (ToF) sensors.*
- *RGBD filtering using bilateral and trilateral filtering pipelines.*
- *Depth fusion between multiple depth sources as well as between a depth source and a raster image sensor.*
- *Multi-sensor depth registration utilizing both 3D and 2D features and different variations of the Iterative Closest Point (ICP) algorithm.*
- *Depth up-sampling and noise-reduction.*

### **Human-Machine Interface,**

- *Data acquisition and calibration of augmented and virtual reality systems.*
- *3D scan/display systems utilizing multiple depth sensors.*

### **Pattern Recognition,**

- *Cost function derivation using bayesian inference for the purpose of clustering and modeling.*
- *Unsupervised clustering using FCM, PCM, FPCM, and other variants.*
- *Extensive research on the stability of fuzzy clustering models.*
- *Principal Component Analysis (PCA) for color classification, including skin detection and color image segmentation.*

### **Symbology,**

- *Symbology detection and interpretation, using available technologies as well as designing in-house solutions.*

### **Computational Photography,**

- *Color transfer between color images and color video sequences.*
- *Colorization of available grayscale image and video sequences using provided color content.*

### **Image Data Management,**

- *Visual watermarking and data hiding using redundancy in the spectral domain.*

### **Inertial Data Processing,**

- *Accelerometer data processing for the purpose of validation and augmentation of optical systems.*

Items in this list refer to tasks completed in previous employments or in the academia. Further details will be provided upon request, subject to NDA restrictions.

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## Education

- 2005–2009 **Ph.D.**, *University of Manitoba, Canada.*  
Electrical and Computer Engineering Department
- 2003–2005 **Master of Science**, *Sharif University of Technology, Iran.*  
Mathematics Science Department, Computer Science Group (Scientific Computation)
- 1996–2003 **Bachelor of Science**, *Sharif University of Technology, Iran.*  
Electrical Engineering Department, Control Group
- 1992–1996 **High school**, *Exceptional Talents High School, Iran.*  
Diploma in Physics and Mathematics

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## Certifications

- 2016 **Machine Learning**, *Machine Learning Foundations: A Case Study Approach*.  
Certificate Course offered by University of Washington on Coursera
- 2013 **Patents**, *Understanding Patents - An Introductory Course*.  
McGill University School of Continuing Studies

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## Patents

- "*Classified Title*", Provisional Patent, Filing Date September 2014.
- "*Holocam Systems and Methods*", US Patent US20150261184, Publication Date 17 September 2015.
- "*HMD Calibration with Direct Geometric Modeling*", EU Patent No. 15175799.4 - 1902, Filing Date 8 July 2015.
- "*Method and Apparatus for Improved Training of Object Detecting System*", US Patent 20140079314, Publication Date 20 March 2014.
- "*Method for simulating impact printer output, evaluating print quality, and creating teaching print samples*", US Patent 8654398, Publication Date 18 February 2014.
- "*Method And Apparatus For Object Pose Estimation*", US Patent 8467596, Publication Date 18 June 2013.

Declassified titles will be posted upon the completion of the patenting procedure.

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## Employment History

- 2016–Current **Senior Scientific Developer**, *Fio Corporation, Toronto, Canada*.
- 2015–2016 **Research Scientist**, *Intellijoint Surgical, Waterloo, Canada*.  
Research on surgery-assistance products which utilize machine vision in order to carry out and confirm geometrical measurements.
- 2009–2015 **Researcher**, *Imaging Group, Epson Canada Limited, Toronto, Canada*.  
Conduct research and recommend solutions for problems in the fields of Visual Inspection, Symbology Detection, 3D Object Detection and Pose Estimation, Camera Calibration, Augmented and Virtual Reality, 3D Scan/Display Systems.
- 2001–2004 **Process Control Engineer**, *Karband Eng. Co., Tehran, Iran*.  
Responsible for design, implementation and erection of PLC-based control systems for medium-sized machinery in pipe and profile production plants.
- 1998–2009 **Research Assistant**, *University of Manitoba, Telecommunications Research Laboratories (TRLabs) Winnipeg and Biomechanics Laboratory, Sharif University of Technology*.  
Conduct research on projects related to Network Optimization, Earthquake Damage Detection using Satellite Imagery, Human Gait Analysis, 3D Surface Reconstruction, Color Image Processing with Applications in Watermarking, Encryption, Compression, Color Transfer, Grayscale Image Colorization, and Pornography Detection.

- 2005 **University Instructor**, *Shariati University*.  
Digital Image Processing (Undergraduate Course).
- 2004–2007 **Teaching Assistant**, *University of Manitoba and Sharif University of Technology*.  
For Advanced Digital Image Processing (Graduate Course), Digital Control, and Communication Systems (Undergraduate Courses).

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## Skills

**Computer Programming**, *C/C++ and Python*.

**Patents**, *Keyword creation, patent search, patent review, invention disclosures and algorithm description*.

**MATLAB**, *C/MEX and Object-Oriented Programming, Octave*.

**Web Programming**, *php and MySQL*.

**Other**, *L<sup>A</sup>T<sub>E</sub>X, POV-Ray, OpenCV, IVT, PCL, CImg, OpenGL, Armadillo, Gandalf, and other open-source tools*.

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## Selected Publications

**Ph.D. Thesis**, *QoS-Constrained Information Theoretic Capacity Maximization in CDMA Systems*, Electrical and Computer Engineering Department, University of Manitoba, Winnipeg, Manitoba, Canada, Supervised by Prof. Attahiru Sule Alfa (Ph.D.), 2005–2009.

**M.Sc. Thesis**, *Color Image Processing using Principal Component Analysis*, Mathematics Science Department, Sharif University of Technology, Tehran, Iran, Supervised by Shohreh Kasaei (Ph.D.) and A. Daneshgar (Ph.D.), 2004–2005.

**Journal Paper**, *Incorporating spatial context into fuzzy-possibilistic clustering using Bayesian inference*, Arash Abadpour, Journal of Intelligent and Fuzzy Systems, Accepted for Publication, August 2015..

**Journal Paper**, *A Sequential Bayesian Alternative to the Classical Parallel Fuzzy Clustering Model*, Arash Abadpour, Information Sciences, Volume 318, October 2015, Pages 28–47..

**Journal Paper**, *On Applications of Pyramid Doubly Joint Bilateral Filtering in Dense Disparity Propagation*, Arash Abadpour, 3D Research, Volume 5, Issue 2, 25 April 2014, Pages 1–20.

**Journal Paper**, *Color PCA Eigenimages and Their Application to Compression and Watermarking*, Arash Abadpour and Shohreh Kasaei, IEE Image & Vision Computing, Volume 26, Issue 7, July 2008, Pages 878–890.

**Journal Paper**, *Closed Form Solution for Maximizing the Sum Capacity of Reverse-Link CDMA System with Rate Constraints*, Arash Abadpour, Attahiru Sule Alfa, and Anthony C.K. Soong, IEEE Transactions on Wireless Communications, Volume 7, Issue 4, April 2008, Pages:1179–1183.

**Journal Paper**, *Video-on-Demand Network Design And Maintenance Using Fuzzy Optimization*, Arash Abadpour, Attahiru Sule Alfa, and Jeff Diamond, IEEE Transactions on Systems, Man, and Cybernetics, Part B, April 2008, Volume 38, Issue 2, Pages: 404–420.

**Journal Paper**, *Unsupervised, Fast and Efficient Color Image Copy Protection*, Arash Abadpour and Shohreh Kasaei, IEE Proceedings Communications, October 2005, Volume 152, Issue 5, Pages 605–616.

Detailed list can be found in the full version of this resume or at <http://abadpour.com>.

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## Selected Honors & Awards

2005–2009 **Ph.D. Scholarship**, *Telecommunication Research Labs (TRLabs), Winnipeg (Total of \$72,000)..*

2006–2007 **Ph.D. Fellowship**, *Edward R. Toporeck Graduate Fellowship in Engineering and University of Manitoba International Graduate Student Scholarship (IGSS) (Total of \$9,288)..*

2002 **Achievements during the Masters of Science Studies**, *5th Place in the National M.Sc. Examination for Computer Engineering (Artificial Intelligence), 11th Place in the National M.Sc. Examination for Computer Sciences, 4th Place in the 7-th National Scientific Olympiad for Masters Students, papers praised in different conferences..*

1995–1996 **High School Achievements**, *Awarded two Silver Medals in the Iranian National Mathematics and Computers Olympiads. Given the 234th highest ranking in the Iranian National University Entrance Examination among 500,000 participants (estimated number)..*

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***References are available upon request.***

*Updated: September 2016.*