

ASHUTOSH CHATURVEDI

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Education

Case Western Reserve University Cleveland, OH Feb 2005 - Present
Ph.D. Candidate in Biomedical Engineering

Research Advisor: Dr. Cameron McIntyre in Department of Biomedical Engineering at Cleveland Clinic.

Case Western Reserve University Cleveland, OH May 2002 - Jan 2005
Masters of Science in Engineering (M.S.E.) degree in Biomedical Engineering

Research Advisor: Dr. Zhenghong Lee in Department of Radiology at University Hospitals of Cleveland.

Case Western Reserve University Cleveland, OH May 1997 - May 2002
Bachelors of Science in Engineering (B.S.E.) degree in Biomedical Engineering

Research Interests

- Deep Brain Stimulation (DBS)
- Brain-Machine Interfaces (BMI)
- Functional Electrical Stimulation (FES)
- Computational Modeling of Electrophysiological Systems and Electric Fields
- Biomedical Imaging (CT, MRI)
- Functional Imaging (DTI, CDI, fMRI, PET, SPECT, Autoradiography)
- 3D Visualization and Modeling
- 3D Image Processing
- Artificial Intelligence

Research Experiences

Cleveland Clinic Cleveland, OH Feb 2005 - Present
Ph.D. Graduate Student in the Deep Brain Stimulation Lab

- Investigated current-steering for various multipolar settings within subthalamic nucleus deep brain stimulation for patient with Parkinson's Disease.
- Computational modeling of deep brain stimulation for neuropsychiatric disorders, such as Depression and Obsessive-Compulsive Disorder.
- Fiber tractography of internal capsule fibers for validating various computational models that were developed.
- Conducted in-vitro experiments to determine a voltage-drop that occurs at the electrode-electrolyte interface. Also made impedance measurements.
- Designed computational models, matching clinical impedance values, that vary in complexity and detail.
- Converted diffusion-weighted imaging to diffusion tensor data to use for fiber tracking as well as creating a non-homogenous, non-isotropic brain volume.
- Performed localization of the stimulating electrodes within the patient-space, as well as 3D segmentation of relevant nuclei.
- Conducted non-rigid and non-affine co-registrations of patient imaging data to an atlas brain for multi-patient studies.

- Created various axon models of relevant white matter fiber pathways within the brain and determined the stimulation threshold required to activate them.
- Created a database for cataloging patient imaging data and results.

University Hospitals of Cleveland Cleveland, OH May 2002 - Jan 2005
M.S. Graduate Student in the Molecular Imaging Lab

- M.S. Thesis on “3D Segmentation and Skeletonization to Build an Airway Tree Data Structure for Small Animals.”
- Investigated CT motion artifacts on lung airway geometry using retrospective cardiac and respiratory gating.
- Validated PET and mapping results for the canine study (below) using histology and autoradiography imaging.
- Canine inhalation study using C11-labeled drug for studying and modeling drug deposition for pulmonary disease.
- CT and PET imaging of canines for an inhaled drug deposition study.
- PET imaging for a woodchuck model of hepatocellular carcinoma.
- Conducted blood sampling and analyzed CT data for a Cystic Fibrosis clinical study.

Work Experiences

DEH Microsystems LLC Cleveland, OH Jun 2009 - Present
Co-Founder, Sales Manager, and Technical Liaison

- Extensive experience in building customized servers, workstations, and high-performance computing clusters for clients in the academic, research, and corporate industries.

Philips Medical Systems Cleveland, OH Jan 1999 - Jan 2002
CT Division, PinPoint Project Software Programmer and Designer

- Designed, programmed, and ported software for the PinPoint system. This device was a frameless, stereotactic guidance system attached to a CT scanner used for interventional procedures.

Technical Assistance Center Cleveland, OH Aug 1997 - Jan 2001
Macintosh Specialist

- Fixed software and network related technical problems for various types of computers on campus.

Plain Dealer Electronic Learning Center Cleveland, OH Aug 1997 - May 2000
Computer Lab Assistant and Manager

- Monitored and provided user support for a Windows NT computer lab on campus.

Teaching Experiences

Case Western Reserve University Cleveland, OH Aug 2007 - Dec 2007
Teaching Assistant for EBME 308 - Undergraduate Signals and Systems

- Graded quizzes, homework, and exams.
- Conducted a weekly laboratory class of around 30 students.
- Created exam questions and lab materials.

Case Western Reserve University Cleveland, OH Jan 2007 - May 2007
Teaching Assistant for ENGR 225 - Undergraduate Thermodynamics

- Graded quizzes, homework, and exams.
- Taught a weekly recitation class of around 30 students.

Case Western Reserve University Cleveland, OH Aug 2003 - Dec 2003
Teaching Assistant for EBME 313 - Undergraduate Biomedical Engineering Lab

- Organized labs for the undergraduate biomedical engineering students.
- Assisted in evaluating students' performance during final presentations.

Publications

- Mikos A, Bowers D, Noecker A, McIntyre CC, Won M, **Chaturvedi A**, Foote K, Okun MS. "Patient-specific analysis of the relationship between the volume of tissue activated during DBS and verbal fluency." *NeuroImage*: 2009 (in press).
- **Chaturvedi A**, Butson CR, Lempka SF, Cooper SE, McIntyre CC. "Patient-specific models of deep brain stimulation: influence of model complexity on neural activation predictions." *Brain Stimulation*: 2010, 3(2), 65-77.
- Luján JL, **Chaturvedi A**, McIntyre CC. "Tracking the mechanisms of deep brain stimulation for neuropsychiatric disorders." *Frontiers in Bioscience*: 2008 May 1;13:5892-904
- **Chaturvedi A**, Butson CR, Cooper SE, McIntyre CC. "Subthalamic nucleus deep brain stimulation: accurate axonal threshold prediction with diffusion tensor based electric field models." *Conf Proc IEEE Eng Med Biol Soc*: 2006, 1, 1240-1243.
- **Chaturvedi A** and Lee Z. "Three-dimensional segmentation and skeletonization to build an airway tree data structure for small animals." *Physics in Medicine and Biology*: 2005, 50(7), 1405-1419.
- Weinberg BD, Schomisch SJ, Rahmatalla M, Finlay WH, **Chaturvedi A**, Wojtkiewicz GR, and Lee Z. "Mapping of PET-measures aerosol deposition: a comparison study." *Journal of Aerosol Science*: 2005, 36(9), 1157-1176.
- Yanof J, Haaga J, Klahr P, Bauer C, Nakamoto D, **Chaturvedi A**, and Bruce R. "CT-integrated robot for interventional procedures: Preliminary experiment and computer-human interfaces." *Computer Aided Surgery*: 2002, 6(6), 352-359.

Manuscripts Under Review

- Luján JL, **Chaturvedi A**, Malone DA, Rezai AR, Machado AG, McIntyre, CC. "Identification of axonal pathways associated with therapeutic and non-therapeutic neuropsychiatric outcomes for deep brain stimulation of the ventral anterior internal capsule." Submitted to *Biological Psychiatry*.

Manuscripts in Preparation

- **Chaturvedi A**, Luján JL, McIntyre CC. “Characterization of the volumes of tissue activated during multipolar deep brain stimulation.” Manuscript in preparation.
- **Chaturvedi A**, Foutz T, McIntyre CC. “Impact of current steering between anodes and cathodes in the context of subthalamic nucleus deep brain stimulation.” Manuscript in preparation.
- Luján JL, **Chaturvedi A**, Noecker AM, McIntyre, CC. “Automated 3D brain atlas fitting to magnetic resonance images and microelectrode recordings from deep brain stimulation surgeries.” Manuscript in preparation.

Abstracts Presented at Peer-Reviewed Conferences

- Effects of current steering on the activation of clinically relevant fiber pathways during deep brain stimulation of the subthalamic region” – Neuroscience 2009
- “Integrating 3D brain atlases, fiber tractography, and axonal activation models to build patient-specific models of deep brain stimulation” – Neuroscience 2008
- “Patient-specific models of deep brain stimulation: influence of model complexity on neural activation predictions” – Neural Interfaces Conference 2008
- “Integrating Fiber Tractography, 3D Imaging, and Axonal Activation Models to Improve Deep Brain Stimulation Electrode Placement.” – American Society for Stereotactic and Functional Neurosurgery 2008.
- “Subthalamic Nucleus Deep Brain Stimulation: Accurate Axonal Threshold Prediction with Diffusion Tensor Based Electric Field Models.” – 28th IEEE EMBS Annual International Conference 2006.
- “Subthalamic Nucleus Deep Brain Stimulation: Accurate Axonal Threshold Prediction with Diffusion Tensor Based Electric Field Models.” – Neural Interfaces Workshop 2006.
- “CT Measured Motion Effects on Airway Geometry” – Case Research Showcase 2004.
- “Pulmonary Imaging with Co-registered PET-CT” – Case Research Showcase 2004.
- “Skeletonization Techniques Applied for Pulmonary Imaging” – Case Research Showcase 2003.
- “PET Imaging of Woodchuck Model of Hepatocellular Carcinoma” – University Hospitals of Cleveland Cancer Research Center Retreat 2002.
- “CT-Integrated Stereotactic Arm for Image-guided Biopsy: Comparison of Speed and Accuracy Using Assisted and Unassisted Methods” – RSNA Conference 2001.
- “Computer Display with Three-axis Controller for Robotic-assisted Interventional Procedures” – RSNA Conference 2000.
- “Interactive Computer User Interface for Planning Robot-Assisted Biopsy” – RSNA Conference 1999.

Computer Skills

Programming Languages

IDL, MATLAB, C, C++, Python, OpenGL, Visual Basic, HTML, dHTML, PHP,

Javascript, SCIRun, NEURON, bash.

Programming Environments

Visual Studio .NET 2003, IDL, MATLAB, Microsoft Visual C++ 6.0, Visual Basic .NET 2003, Dreamweaver MX, SCIRun, Analyze.

Computer/OS Systems

Macintosh (MacOS 7.x-10.x), Windows (95, 98, 2000, Me, NT, XP, Vista, 7), Unix (Darwin, RedHat, Mandrake, Ubuntu, CentOS, Fedora, Rocks Clusters, SunOS, Irix)

Relevant Coursework

Neurosciences

Principles of Neuroscience, Neurobiology, Computational Neuroscience, Applied Neural Control.

Imaging

Computer Graphics, Biomedical Image Processing and Analysis, Mathematics of Imaging in Industry & Medicine, Medical Imaging Fundamentals, Lab Computing in Biomedical Engineering, Systems Programming, Algorithms & Data Structures, Introduction to Artificial Intelligence, Design of Object-Oriented Systems.

Engineering

Design & Analysis in Science & Engineering, Systems and Signals in Biomedical Engineering, Biomedical Transducers, Modeling of Biomedical Systems, Principles of Biomedical Instrumentation, Electronics for Biomedical Engineering, Statistics of Design and Analysis.

Sciences

Physiology and Biophysics I/II, Genome Pathways Databases, Cell Structure and Function, Genetics, Biomaterials in Drug Delivery, Tissue and Cell Engineering, Introduction to Biomedical Materials.

Honors and Awards

- 2010 Figure made cover of *Brain Stimulation* Vol. 3, Issue 2.
- 2010 Figure made cover of *Brain Stimulation* Vol. 3, Issue 1.
- 2008 Travel Assistance Award. NIH/NCRR Center for Integrative Biomedical Computing Workshop. Salt Lake City, UT.
- 2006 Student Paper Competition 3rd Place Award. 28th Annual International Conference of the IEEE Engineering in Medicine and Biology Society. New York City, NY.
- 2006 Travel Assistance Award. 28th Annual International Conference of the IEEE Engineering in Medicine and Biology Society. New York City, NY.
- 2006 Travel Assistance Award. NIH/NINDS 36th Annual Neural Interfaces Workshop. Bethesda, MD.

Professional Memberships

IEEE Engineering in Medicine and Biology Society (EMBS)
Society for Neuroscience (SFN)

References

References are available upon request.