



# Thesis Supervision and Research Mentoring

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## PH.D. (OR M.S./PH.D.) ADVISEES AT USF

1. **Ms. Yun Bai**
2. **Mr. Robinson Czajkowski**

## PH.D. (OR M.S./PH.D.) MENTEES AT BU

1. **Charles P. Saunders**, Now with Facebook.
  - **Thesis:** Occluder-aided non-line-of-sight imaging.
  - Ph.D. mentee at Boston University, Mar. 2017 – Dec. 2019.
2. **Minxu Peng**, Ph.D. student at Boston University, Mar. 2017 – Dec. 2019.
3. **Sheila Werth**, Ph.D. student at Boston University, Sep. 2017 – Dec. 2019.
  - Best Student Poster Award at Int. Conf. on Computational Imaging, 2018.
  - BU CISE Best Student Paper Award, 2021.

## MASTERS, UNDERGRADUATE MENTEES

1. **Lokambika Muthu**, University of South Florida., Jan. 2021 – May 2021.
  - **Project:** Non-line-of-sight imaging.
2. **Nicolle Oliver**, University of South Florida., Oct. 2020 – Dec. 2020.
  - **Project:** Non-line-of-sight imaging.
3. **Safa C. Medin**, Boğaziçi University, intern at BU, Jun. 2017 – Sep. 2017 and Jun. 2018 – Sep. 2018.
  - **Project:** Optimal stopping times for estimating arrays of Bernoulli parameters.
  - Now Ph.D. student at MIT (EECS).
4. **Roxana Alexandru**, M.Eng. Electrical and Electronic Engineering at Imperial College London, Nov. 2015 – Jun. 2016.
  - **Project:** Rumour Source Detection in Social Networks.
  - Awarded **Eric Laithwaite Prize** for ‘outstanding innovation in the final year undergraduate individual project’.
5. **Tianxiao Zhao**, B.Eng. Electrical and Electronic Engineering at Imperial College London, Nov. 2015 – Jun. 2016.
  - **Project:** Rumour Source Detection in Social Networks.

## HIGH SCHOOL MENTEES

1. **Rishabh Bose**, RISE scholar at Boston University, Jul. 2019 – Aug. 2019.
  - **Project:** Non-line-of-sight imaging.
  - 2020 Regeneron Science Talent Search Top 300 Scholar for the completed project.

## Thesis Committees

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1. **Charles Saunders**, – “Occluder-aided non-line-of-sight imaging,” Ph.D., Electrical and Computer Engineering, BU, June 2021.
2. **Almuthanna Nasser**, – “Adaptive Network Slicing in Fog RAN for IoT with Heterogeneous Latency and Computing Requirements: A Deep Reinforcement Learning Approach,” Ph.D. Computer Science and Engineering, USF, May 2021.
3. **Jinghan Meng**, “Design of Support Measures for Counting Frequent Patterns in Graphs,” Ph.D. Computer Science and Engineering, USF, June 2020.

## Invited Talks

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1. **Fields Institute**, focus program on ‘Data Science, Approximation Theory, and Harmonic Analysis,’ Toronto, Canada (May–Jun. 2021\*)
2. **SIAM Conference on Imaging Science (IS20)**, Symposium on Non-Line-of-Sight Imaging: Techniques and Applications, Toronto, Canada (Jul. 2020\*).
3. **University of South Florida**, AI+X Seminar, Tampa FL (Mar. 2020).
4. **McGill University**, Dept. of Electrical and Computer Engineering, Montreal, Canada (Mar. 2019).
5. **University of South Florida**, Dept. of Computer Science and Engineering Tampa, FL (Mar. 2019).
6. **Michigan State University**, Dept. of Electrical and Computer Engineering, Lansing, MI (Feb. 2019).
7. **University of Pennsylvania**, Dept. of Electrical Engineering, Pennsylvania, PA (Feb. 2019).

8. **Banff International Research Station (BIRS) Workshop** on ‘Intersection of Information Theory and Signal Processing: New Signal Models, their Information Content and Acquisition Complexity,’ Calgary, Canada (Oct. 29, 2018).
  9. **Mitsubishi Electric Research Laboratories**, Cambridge, MA (May 30, 2018).
  10. **Information Theory and Applications (ITA) workshop**, Graduation day talk, San Diego, CA (Feb. 2018).
  11. **Vanderbilt University**, Dept. of Mathematics ‘Computational Analysis Seminar,’ Nashville, TN (Nov. 8, 2017).
  12. Int. Conf. on Sampling Theory and Applications, Special Session on ‘Dynamical Sampling,’ Tallinn, Estonia (Jul. 3, 2017).
  13. **Boston University**, ‘Electrical and Computer Engineering Seminar,’ Boston, MA (Nov. 4, 2016).
  14. **University of Bremen**, Zentrum für Technomathematik Workshop on ‘Inverse Problems for PDEs,’ Bremen, Germany (Mar. 29, 2016).
  15. **Allerton Conference**, Special session on ‘Inverse Problems,’ Allerton, IL (Oct. 2, 2015).
- [\*cancelled/rescheduled due to the COVID-19 pandemic.]

## Publications

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### JOURNAL PUBLICATIONS

1. S. Li, C. Saunders, D. J. Lum, J. Murray-Bruce, V. K. Goyal, T. Čížmár, and D. B. Phillips, “Compressively sampling the optical transmission matrix of a multimode fibre,” *Light: Science & Applications*, vol. 10, no. 1, pp. 1–15, 2021.
2. M. Peng, J. Murray-Bruce, and V. K. Goyal, “Time-resolved focused ion beam microscopy: modeling, estimation methods, and analyses,” *IEEE Transactions on Computational Imaging*, vol. 7, pp. 547–561, 2021.
3. S. W. Seidel, J. Murray-Bruce, Y. Ma, C. Yu, W. T. Freeman, and V. K. Goyal, “Two-dimensional non-line-of-sight scene estimation from a single edge occluder,” *IEEE Transactions on Computational Imaging*, vol. 7, pp. 58–72, 2020. **(BU CISE Best student paper award)**
4. J. Rapp, C. Saunders, J. Tachella, J. Murray-Bruce, Y. Altmann, J.-Y. Tournet, S. McLaughlin, R. M. Dawson, F. N. Wong, and V. K. Goyal, “Seeing around corners with edge-resolved transient imaging,” *Nature communications*, vol. 11, no. 1, pp. 1–10, 2020.
5. M. Peng, J. Murray-Bruce, K. K. Berggren, and V. K. Goyal, “Source shot noise mitigation in focused ion beam microscopy by time-resolved measurement,” *Ultramicroscopy*, vol. 211, p. 112948, 2020.
6. C. Saunders, J. Murray-Bruce, and V. K. Goyal, “Computational periscopy with an ordinary digital camera,” *Nature*, vol. 565, no. 7740, pp. 472–475, 2019.
7. S. C. Medin, J. Murray-Bruce, D. Castanon, and V. K. Goyal, “Beyond binomial and negative binomial: Adaptation in bernoulli parameter estimation,” *IEEE Transactions on Computational Imaging*, vol. 5, no. 4, pp. 570–584, 2019.
8. J. Murray-Bruce and P. L. Dragotti, “A sampling framework for solving physics-driven inverse source problems,” *IEEE Transactions on Signal Processing*, vol. 65, no. 24, pp. 6365–6380, 2017.
9. —, “Physics-driven quantized consensus for distributed diffusion source estimation using sensor networks,” *EURASIP Journal on Advances in Signal Processing*, vol. 2016, no. 1, pp. 1–22, 2016.
10. —, “Estimating localized sources of diffusion fields using spatiotemporal sensor measurements,” *IEEE Transactions on Signal Processing*, vol. 63, no. 12, pp. 3018–3031, 2015.

### CONFERENCE PUBLICATIONS

1. C. Saunders, J. Rapp, J. Tachella, J. Murray-Bruce, Y. Altmann, J.-Y. Tournet, S. McLaughlin, R. M. Dawson, F. N. Wong, and V. K. Goyal, “Edge-resolved transient imaging,” in *CLEO: QELS\_Fundamental Science*. Optical Society of America, 2021, pp. JTU3A–96.
2. C. Saunders, W. Krska, J. Tachella, S. W. Seidel, J. Rapp, J. Murray-Bruce, Y. Altmann, S. McLaughlin, and V. K. Goyal, “Edge-resolved transient imaging: Performance analyses, optimizations, and simulations,” in *2021 IEEE International Conference on Image Processing (ICIP)*. IEEE, 2021, pp. 2858–2862.
3. C. Saunders, R. Bose, J. Murray-Bruce, and V. K. Goyal, “Multi-depth computational periscopy with an ordinary camera,” in *ICASSP 2020-2020 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2020, pp. 9299–9305.

4. J. Murray-Bruce, C. Saunders, and V. K. Goyal, "Occlusion-based computational periscopy with consumer cameras," in *Wavelets and Sparsity XVIII*, vol. 11138. International Society for Optics and Photonics, 2019, p. 111380X.
5. S. W. Seidel, Y. Ma, J. Murray-Bruce, C. Saunders, W. T. Freeman, C. Y. Christopher, and V. K. Goyal, "Corner occluder computational periscopy: Estimating a hidden scene from a single photograph," in *2019 IEEE International Conference on Computational Photography (ICCP)*. IEEE, 2019, pp. 1–9.
6. S. W. Seidel, Y. Ma, J. Murray-Bruce, C. Saunders, W. T. Freeman, C. Y. Christopher, and V. K. Goyal, "Corner occluder computational periscopy: Estimating a hidden scene from a single photograph," in *2019 IEEE International Conference on Computational Photography (ICCP)*. IEEE, 2019, pp. 1–9.
7. M. Peng, J. Murray-Bruce, K. K. Berggren, and V. Goyal, "Source shot noise mitigation in scanned beam microscopy," in *Int. Conf. on Electron, Ion, and Photon Beam Technology and Nanofabrication*, May 2018.
8. —, "Source shot noise mitigation in helium ion and focused ion beam microscopy," in *Int. Conf. on Helium and emerging Focused Ion Beams*, June 2018.
9. S. W. Seidel, J. Murray-Bruce, Y. Ma, C. Saunders, W. T. Freeman, C. Y. Christopher, and V. K. Goyal, "Occluder aided computational periscopy," in *2018 IEEE International Conference on Computational Photography (ICCP)*. IEEE, May 2018. **(Best poster award)**
10. S. C. Medin, J. Murray-Bruce, and V. K. Goyal, "Optimal stopping times for estimating bernoulli parameters with applications to active imaging," in *2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2018, pp. 4429–4433.
11. J. Murray-Bruce and P. L. Dragotti, "Spatiotemporal sampling trade-off for inverse diffusion source problems," in *2017 International Conference on Sampling Theory and Applications (SampTA)*. IEEE, 2017, pp. 55–59.
12. —, "Solving inverse source problems for sources with arbitrary shapes using sensor networks," in *25th European Symposium on Artificial Neural Networks, Computational Intelligence and Machine Learning (ESANN)*, 2017.
13. —, "Solving inverse source problems for linear pdes using sparse sensor measurements," in *2016 50th Asilomar Conference on Signals, Systems and Computers*. IEEE, 2016, pp. 517–521.
14. —, "Solving physics-driven inverse problems via structured least squares," in *2016 24th European Signal Processing Conference (EUSIPCO)*. IEEE, 2016, pp. 331–335.
15. —, "Reconstructing non-point sources of diffusion fields using sensor measurements," in *2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2016, pp. 4004–4008.
16. —, "Consensus for the distributed estimation of point diffusion sources in sensor networks," in *2015 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2015, pp. 3262–3266.
17. —, "Estimation of multiple instantaneous point sources of advection-diffusion fields from field samples," in *10th IMA International Conference on Mathematics in Signal Processing*. Institute for Mathematics and its Applications (IMA), 2014.
18. —, "Reconstructing diffusion fields sampled with a network of arbitrarily distributed sensors," in *2014 22nd European Signal Processing Conference (EUSIPCO)*. IEEE, 2014, pp. 885–889.
19. —, "Spatio-temporal sampling and reconstruction of diffusion fields induced by point sources," in *2014 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. IEEE, 2014, pp. 31–35.

## Industry Experience

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### SunGard Corp (now a part of FIS Global)

#### IMPLEMENTATIONS CONSULTANT

- Responsible for the Adaptiv™. Fast Credit Checker (FCC) platform.
- Developed additional functionality/extensions of, and made Optimizations to the Adaptiv™ FCC.
- Test-driven development in C#.

Milton park, Abingdon, UK

Jun. 2012 - Sep. 2012

- Java Developer within SwissKey™. Clearing (SKC) team.
- Made various enhancements to and optimizations of the Client File Reconciliation engine (an internal facing platform for the SKC QA team).
- Learned and applied the Scrum framework as an Agile software development methodology.

## Service and Professional Activities

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### PROFESSIONAL MEMBERSHIPS

- **Member IEEE:** signal processing society (SPS) member and computational imaging special interest group.
- **Member Optica (formerly The Optical Society (OSA)).**

### TECHNICAL PROGRAM COMMITTEES

- **IEEE Computational Imaging Technical Committee (CI TC) Member,** (2020 – Present).
- **IEEE Research and Applications of Photonics in Defense (RAPID) Conf.,** (2020 – Present).
- **IEEE Statistical Signal processing (SSP) Workshop,** (2018 – Present).
- **IEEE International Conference on Data Science and Advanced Analytics (DSAA).** (2021).

### REVIEWER SERVICES

- **Journals:** Nature, Nature Photonics, IEEE Signal Processing Magazine, IEEE Transactions on Signal Processing, IEEE Transactions on Image Processing, IEEE Transactions on Computational Imaging, IEEE Transactions on Signal and Image Processing over Networks, Elsevier Signal Processing, Elsevier Neurocomputing, SPIE Journal of Electronic Imaging (JEI), EURASIP Journal of Advances in Signal Processing, MDPI Sensors, MDPI Remote Sensing, MDPI Applied Sciences.
- **Conferences:** IEEE ICASSP 2021, DSAA 2021, IEEE RAPID 2021, IEEE RAPID 2020, SSP 2020, ICASSP 2019, SSP 2018, WCNC 2017, ESANN 2017, SSP 2016, ICASSP 2016, EUSIPCO 2014.

## Press Coverage and Publicity

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### ITA 2019 WORKSHOP HIGHLIGHTS

- Qualcomm Institute, **Highlights from the 2019 ITA Workshop's Graduation Day (Decoding information in shadows)**, Xochitl Rojas-Rocha, February 25, 2019

### NON-LINE-OF-SIGHT IMAGING WITH AN ORDINARY DIGITAL CAMERA

- Nature News, **How an ordinary camera can see around corners**, Davide Castelvetti, January 23, 2019.
- The Economist (print issue 24 Jan 2019), **A Simple Camera and an Algorithm Let You See around Corners**, Jeff Hecht, January 23, 2019.
- Scientific American, **A camera that can see round corners**, January 24, 2019.
- Cosmos Magazine, **Spying around corners just got easier**, Natalie Parletta, January 24, 2019.
- The Daily Free Press, **BU professor develops camera that can see around corners**, Andy Vo and Susannah Sudborough, January 27, 2019.
- Futurism, **Spooky Algorithm Sees Around Corners by Analyzing Shadows**, Dan Robitzski, January 25, 2019.
- ge.com, **The 5 Coolest Things On Earth This Week**, Sam Worley, January 23, 2019.
- The Guardian, **Program allows ordinary digital camera to see round corners**, Ian Sample, January 23, 2019.
- Inside Science, **How to See Around Corners with a Digital Camera**, Marcus Woo, January 23, 2019.
- El Mundo, **La cámara digital que puede tomar imágenes de objetos escondidos**, Amado Herrero, January 23, 2019.
- N+1, **Este algoritmo permitirá a la cámara de tu smartphone ver detrás de las esquinas**, Victor Roman, January 24, 2019.
- New Scientist, **Algorithm that can see around corners could help autonomous cars**, Yvaine Ye, January 23, 2019.
- PhysicsBuzz, **Using Just a Digital Camera, a New Method Lets Scientists See Around Corners**, Kendra Redmond, January 23, 2019.

- Physics World, **Shadowy algorithm allows digital camera to see round corners**, Sam Jarman, January 25, 2019.
- RedShark News, **This incredible new technique allows us to see around corners in photographs!**, Adrian Pennington, January 31, 2019.
- ScienceAlert, **This Not-at-All-Creepy New Computer Program Lets Any Camera See Around Corners**, David Nield, January 25, 2019.
- Science News, **Ordinary cameras can now photograph out-of-sight objects**, Maria Temming, January 23, 2019.
- Smithsonian.com, **Scientists Used an Ordinary Digital Camera to Peer Around a Corner**, Jane Recker, January 23, 2019.
- Springwise, **Algorithm allows cameras to see around corners**, February 12, 2019.
- Tech.Co, **Your Camera Could Soon See Around Corners**, Jack Turner, January 25, 2019.
- The Telegraph, **Soldiers could see round corners using digital cameras with new technology**, Sarah Knapperton, January 23, 2019.
- Times of London, **Camera that could help your car see around corners**, Tom Whipple, January 24, 2019.
- The Wilson Leader Bulletin, **Military dream come true – the camera looks around the corner**, Teodora Torrendo, January 26, 2019.
- The Wire, **A Digital Camera That Can Help You See Beyond Walls**, Sarah Iqbal, February 15, 2019.
- Wired, **Scientists Reconstruct an Object by Photographing its Shadow**, Sophia Chen, January 23, 2019.
- BU Engineering, **Seeing around Corners**, January 23, 2019.
- BU Research, **Can Technology Eliminate Blind Spots?**, January 23, 2019.
- New Scientist, **Digital camera sees around corners by guessing what's lurking behind**, Jon Cartwright, May 17, 2019.
- New Scientist, **Seeing around corners: How to decipher shadows to see the invisible**, Jon Cartwright, November 6, 2019.
- About Trust, **Peeking Around the Corner**, Tanita Hecking, July 2020.
- Additional commentary, repostings, and translations online at many sites including: ABC News, Futura Sciences, Futurity, Handelsblatt, Health imaging, R&D Magazine, le Scienze, TechXplore.

## Skills

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**Programming** Matlab (Expert), C (Advanced), C# (Advanced), Microsoft Office (Advanced), Java (Intermediate), C++ (Intermediate), Python (Intermediate), Delphi Pascal (Advanced), HTML (Advanced), XML (Advanced), JavaScript (Advanced).

**Languages** English, Yoruba.

## Extracurricular activities and interests

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### Imperial College School of Medicine (ICSM) Basketball Team

CAPTAIN AND PRESIDENT

*London, UK*

*Oct. 2010 - Jun. 2012*

### Imperial College London Afro-Caribbean Society 'AfroGala 08/09'

FINANCE MANAGER

*London, UK*

*Nov. 2008 - Feb. 2009*