Wasiur Rahman Khuda Bukhsh

Mathematical Biosciences Institute
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Summary

Interested in applied probability theory, mathematical biology. Provided service to the Governor's Office and the Ohio Department of Health as part of the OSU/IDI COVID-19 response modelling team.

Education

2014 – 2018 **Ph.D. (Dr. rer. nat.), summa cum laude**, *Department of Electrical Engineering and Information Technology, Technische Universität Darmstadt*, Germany.

2009 – 2011 **Master of Statistics (M.Stat.)**, *Indian Statistical Institute*, Kolkata, India.

2006 – 2009 **Bachelor of Science (B. Sc.) with Honours in Statistics**, *University of Calcutta*, Kolkata, India.

Professional Experience

Jan 2020 – **President's Postdoctoral Scholar**, *Mathematical Biosciences Institute and the College of Public Health, The Ohio State University*, Columbus, Ohio, USA.

Oct 2018 – Dec 2019 **Postdoctoral Researcher**, *Mathematical Biosciences Institute, The Ohio State University*, Columbus, Ohio, USA.

Jan 2014 – Sep 2018 **Research Associate**, *Technische Universität Darmstadt*, Darmstadt, Germany.
Department of Electrical Engineering and Information Technology

Jun 2011 – Dec 2013 **Manager**, *ICICI Bank*, Mumbai, India.
Advanced Analytics, Business Intelligence Unit (BIU)

Publications

Peer-reviewed journal publications

[1] **Wasiur R. KhudaBukhsh**⋆, Hye-Won Kang, Eben Kenah, and Grzegorz Rempała. Incorporating age and delay into models for biophysical systems. *Physical Biology*, 18(1), 2020. (⋆Invited paper).

[2] **Wasiur R. KhudaBukhsh**, Boseung Choi, Eben Kenah, and Grzegorz Rempała. Survival Dynamical Systems for the Population-level Analysis of Epidemics. *Interface Focus*, 10(1), 2020.

[3] **Wasiur R. KhudaBukhsh**, Arnab Auddy, Yann Disser, and Heinz Koeppl. Approximate lumpability for markovian agent-based models using local symmetries. *Journal of Applied Probability*, 56, 9 2019.

[4] Hye-Won Kang*, **Wasiur R. KhudaBukhsh***, Heinz Koeppl, and Grzegorz Rempała. Quasi-steady-state approximations derived from a stochastic enzyme kinetics. *Bulletin of Mathematical Biology*, 81(5):1303–1336, 2019. *joint first authors.

[5] **Wasiur R. KhudaBukhsh**, Sounak Kar, Bastian Alt, Amr Rizk, and Heinz Koeppl. Generalized cost-based job scheduling in very large cluster systems. *IEEE Transactions on Parallel and Distributed Systems*, 31(11):2594–2604, 2020.

[6] Boseung Choi, Sydney Busch, Dieudonné Kazadi, Benoit Ilunga, Emile Okitolonda, Yi Dai, Robert Lumpkin, Omar Saucedo, **Wasiur R. KhudaBukhsh**, Joseph Tien, Marcel Yotebieng, Eben Kenah, and Grzegorz A. Rempała. Modeling Outbreak Data: Analysis of a 2012 Ebola Virus Disease Epidemic in DRC. *BIOMATH*, 8(2), 2019.

[7] **Wasiur R. KhudaBukhsh**, Amr Rizk, Sounak Kar, and Heinz Koeppl. Provisioning and performance evaluation of parallel systems with output synchronization. *ACM Transactions on Modeling and Performance Evaluation of Computing Systems (TOMPECS)*, 4(1), 3 2019.

[8] Bastian Alt, Markus Weckesser, Christian Becker, Matthias Hollick, Sounak Kar, Anja Klein, Robin Klose, Roland Kluge, Heinz Koeppl, Boris Koldehofe, **Wasiur R. KhudaBukhsh**, Mahdi Mousavi, Martin Pfannemueller, Amr Rizk, Andy Schuerr, and Ralf Steinmetz. Transitions: A protocol-independent view of the future internet. *Proceedings of the IEEE*, 107(4):835–846, 4 2019.

[9] **Wasiur R. KhudaBukhsh**, Julius Rückert, Julian Wulfheide, David Hausheer, and Heinz Koeppl. SchedMix: Heterogeneous strategy assignment in swarming-based live streaming. *Open Transactions on Communication Systems (OTCS)*, 2019. Accepted for publication.

Peer-reviewed conference proceedings

[10] **Wasiur R. KhudaBukhsh**, Bastian Alt, Sounak Kar, Amr Rizk, and Heinz Koeppl. Collaborative uploading in heterogeneous networks: Optimal and adaptive strategies. In *IEEE International Conference on Computer Communications (INFOCOM)*, pages 1–9, 4 2018. $< 20\%$ acceptance rate. Best-in-Session Presentation Award.

[11] **Wasiur R. KhudaBukhsh**, Amr Rizk, Alexander Frömmgen, and Heinz Koeppl. Optimizing Stochastic Scheduling in Fork-Join Queueing Models: Bounds and Applications. In *IEEE International Conference on Computer Communications (INFOCOM)*, pages 1–9, 5 2017. $\sim 20\%$ acceptance rate.

[12] Adrian Šošić, **Wasiur R. KhudaBukhsh**, A. M. Zourbir, and Heinz Koeppl. Inverse reinforcement learning in swarm systems. In *AAMAS Workshop on Transfer in Reinforcement Learning*, May 2017. Available: `http://www.tirl.info/proceedings/2017/SosicEtal-Inverse.pdf`.

[13] Adrian Šošić, **Wasiur R. KhudaBukhsh**, A. M. Zourbir, and Heinz Koeppl. Inverse reinforcement learning in swarm systems. In *International Conference on Autonomous Agents & Multiagent Systems (AAMAS)*, page 14131421, 5 2017. $\sim 26\%$ acceptance rate, Best Paper Award Finalist.

[14] **Wasiur R. KhudaBukhsh**, Julius Rückert, Julian Wulfheide, David Hausheer, and Heinz Koeppl. Analysing and Leveraging Client Heterogeneity in Swarming-based Live Streaming. In *IFIP Networking Conference (IFIP Networking) and Workshops*, pages 386–394, 5 2016. $\sim 26\%$ acceptance rate.

[15] Mahdi Mousavi, Hussein Al Shatri, **Wasiur R. KhudaBukhsh**, Heinz Koeppl, and Anja Klein. Cross-Layer QoE-based Incentive Mechanism for Video Streaming in Multi-Hop Wireless Networks. In *IEEE 86th Vehicular Technology Conference (VTC)*, 9 2017.

Preprints/Submitted

[16] **Wasiur R. KhudaBukhsh**, Casper Woroszylo, Grzegorz Rempała, and Heinz Koeppl. A Functional Central Limit Theorem for Susceptible-Infected (SI) Process on Configuration Model Graphs. *Advances in Applied Probability*, 2020. Under revision. ArXiv preprint: `https://arxiv.org/abs/1703.06328`.

[17] **Wasiur R. KhudaBukhsh**, Sat Kartar Khalsa, Eben Kenah, Grzegorz Rempała, and Joseph Tien. COVID-19 dynamics in an Ohio prison. 2020. Submitted.

[18] Matthew Wascher, Patrick Schnell, **Wasiur R. KhudaBukhsh**, Joseph Tien, Grzegorz Rempala, and the OSU / IDI COVID-19 Response Modeling Team. Modeling SARS-CoV-2 infection dynamics among residential undergraduates at The Ohio State University. Online. `https://cpb-us-w2.wpmucdn.com/u.osu.edu/dist/2/86711/files/2020/10/osu-campus-model.pdf`, 2020.

Manuscripts in progress

[19] **Wasiur R. KhudaBukhsh**, Matthew Wascher, Mark Weir, Eben Kenah, Elisabeth Root, Joseph H. Tien, and Grzegorz Rempała. Projecting COVID-19 Cases and Subsequent Hospital Burden in Ohio, 2020.

[20] **Wasiur R. KhudaBukhsh**, Boseung Choi, Eben Kenah, and Grzegorz Rempała. PDE and Stochastic PDE limits for biochemical reaction networks, 2020.

[21] Zaynab Diallo, **Wasiur R. KhudaBukhsh**, and Eben Kenah. Semiparametric pairwise regression for infectious disease transmission with external sources of infection, 2020.

[22] Caleb Deen Bastian, **Wasiur R. KhudaBukhsh**, Yuhan Pan, Eben Kenah, and Grzegorz A. Rempała. Predicting the Size and Duration of COVID-19 Outbreaks under Minimal Assumptions, 2020.

[23] Zaynab Diallo*, Yushuf Sharker*, **Wasiur R. KhudaBukhsh**, and Eben Kenah. Pairwise accelerated failure time models with external sources of infection and epidemiological studies of infectious disease transmission, 2020. *Joint first authors.

Thesis and technical notes

[24] **Wasiur R. KhudaBukhsh**. *Model reductions for queueing and agent-based systems with applications in communication networks*. PhD thesis, Technische Universität, Darmstadt, 2018. Available at: `http://tuprints.ulb.tu-darmstadt.de/7588/`.

[25] **Wasiur R. KhudaBukhsh**, Mark Sinzger, and Heinz Koeppl. Bounds on the spectral radius of real-valued non-negative kernels on measurable spaces. Technical report, 2018. arXiv preprint: https://arxiv.org/abs/1808.00258.

Awards and Funding

Awards

1. 2019 Presidents Postdoctoral Scholars Program (PPSP) of the Ohio State University

2. Best-in-Session Presentation Award at the IEEE International Conference on Computer Communications (IEEE INFOCOM), Honolulu, Hawaii, USA, 2018.

Funding

1. NIH K99/R00 Pathway to Independence Award (submitted)
2. The German Academic Exchange Service (DAAD) travel grant (Kongressreise) to participate in the Annual Meeting of the SMB in Sydney, Australia (~ 2000 EUR)

Presentations

Summary: 18 invited and 17 contributed/seminar talks. 5 poster presentations.

Invited talks

1. Special session at the Joint Mathematics Meetings (JMM), virtual, January 6-9, 2021 (upcoming)
2. IDI Virtual COVID-19 Symposium, December 3, 2020
3. Seminar, Institute of Applied Mathematics and Mechanics, University of Warsaw, November 30, 2020
4. Seminar, Institute of Applied Mathematics and Mechanics, University of Warsaw, November 23, 2020
5. Biostatistics seminar, the Ohio State University, Columbus, OH, USA, October 30, 2020
6. Math-Bio seminar, Virginia Tech, virtual, September 23, 2020
7. International Webinar Series on Artificial Intelligence and Machine Learning, virtual, September 18, 2020 (upcoming)
8. Workshop on Life on Planet Earth: Above and Below, MBI, OSU, August 11, 2020
9. International Webinar, Departments of Mathematics and Physics, Bidhan Chandra College, virtual, July 18, 2020
10. Special session of Data Science, Business Intelligence Unit, ICICI Bank, Mumbai, India, July 24, 2020
11. Special session at the Erdős Institute Python Bootcamp, May 2020 (jointly with Marissa Renardy)
12. Biostatistics Seminar, the Ohio State University, Columbus, OH, USA, February 28, 2020
13. Mathematical Modeling and Statistical Analysis of Infectious Disease Outbreaks, CIRM, Marseille, France, February 21, 2020
14. Mini-symposium speaker at the Annual Meeting of the SMB, Montreal, Canada, 2019
15. Mini-symposium speaker at the International Conference on Mathematical Methods and Models in Biosciences (BioMath), June 2019, Poland
16. BIRS-CMO workshop on "Scaling Limits of Dynamical Processes on Random Graphs", May 2019, Oaxaca, Mexico
17. Mini-symposium speaker at the Annual Meeting of the SMB and the JSMB, Sydney, Australia, 2018
18. Cloud Computing, Machine Learning And Networking Research (CLAN) Lab, Purdue University (May, 2017), Host : Vaneet Aggarwal

Contributed talks

1. Mathematical Biosciences Institute (MBI) Seminar, Columbus, Ohio, USA, March 04, 2021
2. Applied Mathematics Seminar, Department of Mathematics, The Ohio State University, November 19, 2020
3. Bernoulli–IMS One World Symposium 2020, virtual, August 25, 2020
4. Mini-symposium speaker at the Annual Meeting of the SMB, virtual, August 19, 2020
5. Joint Statistical Meetings 2020, virtual, August 2-6, 2020

6. Mini-symposium speaker at SIAM Conference on Mathematics of Data Science 2020 (virtual), June 2020
7. MBI Workshop on Mathematical and Computational Methods in Biology, May 6, 2020
8. International Indian Statistical Association Conference (IISA 2019), Mumbai, India, December 28, 2019
9. Latin American Congress of Probability and Mathematical Statistics (CLAPEM) XV, Merida-Yucatán, México, December, 2019
10. Mathematical Biosciences Institute (MBI) Seminar, Columbus, Ohio, USA, October, 2019
11. Joint Statistical Meetings (JSM) - American Statistical Association, Colorado, USA, 2019
12. Stochastic Processes and their Applications, Bernoulli Society, Northwestern University, July 2019, USA
13. International Conference on Mathematical Methods and Models in Biosciences (BioMath), June 2019, Poland
14. Mathematical Biosciences Institute (MBI) Seminar, Columbus, Ohio, USA, 2019
15. IEEE International Conference on Computer Communications (IEEE INFOCOM), Honolulu, Hawaii, USA, 2018
16. IEEE International Conference on Computer Communications (IEEE INFOCOM), Atlanta, GA, USA, 2017
17. IFIP Networking Conference and Workshops, Vienna, Austria, 2016

Poster presentations

1. Mathematical Models in Evolutionary Biology conference, CIRM, Marseilles, France, February 10-14 2020
2. Annual Meeting of the Infectious Disease Institute, The Ohio State University, September 2019, Columbus, OH, USA
3. Joint Statistical Meetings (JSM) - American Statistical Association, Colorado, USA, 2019
4. CMCF Algorithms and Methods for Single Cell Genomics, University of California, Irvine, June 2019, USA
5. BIRS-CMO workshop on "Scaling Limits of Dynamical Processes on Random Graphs", May 2019, Oaxaca, Mexico

Teaching Experience

1. STAT 4201: Introduction to Mathematical Statistics
   Department of Statistics, The Ohio State University, USA
   Role: Instructor
   Terms: Fall semester 2019 (> 120 students)
2. PUBHBIO7193: Individual studies in Biostatistics (Advanced stochastic epidemiology)
   Division of Biostatistics, The Ohio State University, USA
   Role: Instructor (jointly with Eben Kenah)
   Terms: Summer semester 2019
3. Computational Methods for Systems and Synthetic Biology (CMSSB)
   Department of Electrical Engineering and Information Technology, Technische Universität Darmstadt, Germany
   Role: Teaching Assistant
   Terms: Summer semester 2016, Summer semester 2017

Student Supervision and Mentoring

Summary: (Co-) Supervised a total of 12 undergrad (B.Sc.) and 6 M.Sc. students.

M.Sc. Students

1. Robert Lumpkin, 2019, Master degree project (jointly with Prof. Greg Rempala), Department of Mathematics, The Ohio State University, USA (*resulted in the publication [6]*)
2. Arnab Auddy, 2017, Summer internship, Technische Universität Darmstadt, Germany (*resulted in the publication [3]*)
3. Markus Schanz, 2017, Master thesis (jointly with Christian Koch), Technische Universität Darmstadt, Germany
4. Hameer Abbasi, 2017, Master thesis (jointly with Bastian Alt), Technische Universität Darmstadt, Germany
5. Ranjani Krishnan, 2018, Master thesis (jointly with Denny Stohr), Technische Universität Darmstadt, Germany
6. Sayantan Kumar, 2018, Summer internship, Technische Universität Darmstadt, Germany (*manuscript to be submitted for publication*)

Outreach and Service

COVID-19 Modelling Response

1. Provided service to the Ohio Department of Health and Ohio Hospital Association as part of the OSU/IDI COVID-19 response modelling team. Provided daily predictions of COVID-19 cases and resultant hospital burden in the state of Ohio, USA.

Organizing conferences

1. Invited session at the IMS Asia Pacific Rim Meeting, Melbourne, Australia, 2022 (pending acceptance. Jointly with Gursharn Kaur)
2. BIRS Workshop on "Preparing for the next pandemic", June 12-17, 2022 (jointly with Sara Del Valle, Joel C. Miller and Rick Durrett)
3. Invited session at the Annual Meeting of the ENAR, 2021 (jointly with Marissa Renardy)
4. Mini-symposium at the Annual Meeting of the Society for Mathematical Biology, 2020 (jointly with Hye-Won Kang)
5. Mini-symposium at the SIAM Conference on Mathematics of Data Science (MDS20), Cincinnati, OH, USA, June 11, 2020 (jointly with Veronica Ciaconel)
6. Contributed Session at the Latin American Congress of Probability and Mathematical Statistics (CLAPEM) XV, Merida-Yucatán, México, December, 2019 (jointly with Hye-Won Kang)
7. Session at the 2019 International Indian Statistical Association Conference (IISA 2019), Mumbai, India, December 2019 (jointly with Arindam Fadikar)

Tutorials

1. "How to write scientific papers" for MBI REU students, 2019
2. "Introduction to epidemic modelling" for SAMMS REU students, 2019
3. "Modeling the COVID-19 pandemic" for the Erdös Institute bootcamp, May 2020

Mentoring REUs

1. MBI REUs, Summer 2019
2. Ohio 5 SURE students at the College of Public Health, OSU, 2019

Reviewer

1. Journal of Applied Probability/Advances in Applied Probability (Applied Probability Trust)
2. Stochastic Processes and their Applications

3. Bulletin of Mathematical Biology
4. Journal of Chemical Physics
5. Journal of Mathematical Biology
6. PLOS One
7. Mathematics (MDPI)
8. IEEE Transactions on Automatic Control
9. Journal of Mathematics in Industry
10. Journal of Mathematical Analysis and Applications
11. Journal of Scientific Research
12. IEEE Control System Letters
13. IEEE Transactions on Networking
14. IEEE Transactions on Control of Network Systems
15. IEEE Multi-Conference on Systems and Control, Sydney, Australia, 2015
16. American Control Conference (ACC)

Other Services

1. Judge for the OSU Mathematical Contest for Modeling, 2018, 2019
2. Judge for OPA travel awards, the Ohio State University, 2019

Professional Memberships

1. Society for Industrial and Applied Mathematics (SIAM)
2. Bernoulli Society for Mathematical Statistics and Probability
3. The Society for Mathematical Biology (SMB)
4. American Statistical Association (ASA)
5. American Association for the Advancement of Science (AAAS)

Computer Skills

Programming Languages	C, R, Python, SQL, Julia
Software	Matlab, SAS, Microsoft Office, LaTeX

Languages

English	Professional Proficiency
Bengali	Mother Tongue
Hindi	Working Knowledge
German	Intermediate (B1 level)

References

Available upon request.