JEREMI K. OCHAB

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SUMMARY

A theoretical physicist by training, with background in linguistics, interdisciplinary experience, and data science mind-set. Using *Mathematica* for rapid idea development, and collaborating in *Matlab* (with neuroscientists) and *R* (with linguists). Currently, an assistant professor at Jagiellonian University in Cracow, Poland, with his EEG lab.

RESEARCH EXPERIENCE

Department of Theory of Complex Systems, Jagiellonian University:

2020 – present
Senior researcher in Bio-Inspired Artificial Neural Networks
(Team-Net project funded by Foundation for Polish Science)

2018 – present
Assistant professor position (research and teaching)

2016 – 2020
Fluctuation analysis and **machine learning** for human **EEG**
(**PI** of a Sonata project funded by Polish National Science Centre)

2015 – 2016
Time series analysis in **EEG** and actigraphy data in humans
(**post-doc** in a project on applications of Random Matrix Theory)

2014 – 2016
Detection of modular structures in complex networks
(**PI** of a project Preludium funded by Polish National Science Centre)

2009 – 2013
random walks and **clustering** of complex networks (PhD thesis)

Dpt. of Statistical Physics, Jagiellonian University:

2008/2009
synchronization in Kuramoto model of coupled oscillators (MSc thesis)

Institute of Physics, Jagiellonian University:

2004 – 2006
agent based simulations and analytical study of percolation thresholds for **epidemic spread** on static and dynamic small-world networks (student projects)

INTERNSHIPS

2018-2020 ~2 months/year	<u>Centre for Multidisciplinary Studies in Complex Systems and Neuroscience, UNSAM, Buenos Aires, Argentina</u>
	▶ long-term collaboration on modelling and analysis of brain and other critical systems (mainly fMRI data analysed in MATLAB)
2009-2013 11 months	<u>Institute of Theoretical Physics, Leipzig University, Germany</u> ▶ model of **mass condensation** on networks
2007, 2 months	<u>DESY-Zeuthen, Germany:</u> ▶ Summer Student Program, reconstructing air showers in IceTop exp.

SCHOLARSHIPS

2013	The scholarship for outstanding achievements by the Polish Ministry of Science and Higher Education.
2009 – 2013	Foundation for Polish Science's: *International PhD Projects Programme*
2005, 2007	Jagiellonian University, graduate fellowship

EDUCATION

	<u>Jagiellonian University, Cracow</u>
2009 – 2013	Ph. D. in physics **cum laude** (defended on 18th Oct. 2013) Thesis: *Static and dynamic properties of selected stochastic processes on complex networks* (thesis advisor: prof. Zdzisław Burda, Dpt. of Theory of Complex Systems)
2004 – 2009	M.Sc. in theoretical physics **cum laude** Thesis: *The conditions for full synchronization in generalized Kuramoto models* (supervisor: dr hab. Paweł F. Góra; Dpt. of Statistical Physics)
2004 – 2009	Mathematical and Natural Sciences (equivalent to **Joint Honors Programme**; Institute of Physics and the Institute of Mathematics)

TEACHING EXPERIENCE (selection)

	Supervised theses: • past: 3 MSc (2 biophysics, 1 computer science), 2 BSc (physics) • present: 2 PhD (1 neuroscience, 1 linguistics), 3 MSc (physics)
2019, 2020	**Deep Learning** (1 semester, in Python, co-lecturing with prof. P. Białas)
2019	**Introduction to Data Science** (1 sem., in Python), Calculational tools for physics (1 sem., in Mathematica), Logic and Set Theory (1 sem.)
2011-2012	Statistical Field Theory (1 semester), Discrete Mathematics (1 semester)

ORGANIZATION

2020-2021	**Co-ordinating Priority Research Area "DigiWorld" (1.8 m USD/year)** under Strategic Program Excellence Initiative at the Jagiellonian Univ.
	Conferences (website, correspondence, programme, documentation, proceedings):
Cracow, 2019	*Random Matrix Theory: Applications in the Information Era*
Cracow, 2014	*Random Matrix Theory: Foundations and Applications*
Cracow, 2010	*23rd Marian Smoluchowski Symposium on Statistical Physics: Random Matrices, Statistical Physics and Information Theory*

COMPUTER SKILLS

- ▶ advanced in *Mathematica*
- ▶ working experience (3-4 years): *Matlab* (EEGlab package), *R, Python* (Keras, Scikit-learn)
- ▶ rudimentary C/C++ and Bash scripting

ADDITIONAL INFORMATION

Languages	▶ Polish (native)
	▶ English (proficient; M.A. in English translation)
	▶ German (basics)
Software	LaTeX, Overleaf, Zotero, MS Office, Gimp
Interests	Translation (translated seven popular-science books), linguistics, table tennis (in the university Sports Association), dance

PUBLICATIONS

1. Cifre, I., Flores, M.T.M., Ochab, J.K., Chialvo, D.R. Revisiting non-linear functional brain co-activations: directed, dynamic and delayed. Front. Neurosci. (2021; in print) arXiv:2007.15728 [nlin, q-bio].

2. Ochab, J.K., Szwed, J., Oleś, K., Bereś, A., Chialvo, D.R., Domagalik, A., Fąfrowicz, M., Ogińska, H., Gudowska-Nowak, E., Marek, T., Nowak, M.A. Observing changes in human functioning during induced sleep deficiency and recovery periods. PLoS ONE 16, e0255771 (2021).

3. Sommer, W., Stapor, K., Kończak, G., Kotowski, K., Fabian, P., Ochab, J., Bereś, A., & Ślusarczyk, G. The N250 event-related potential as an index of face familiarity: a replication study. Royal Society Open Science 8, 202356 (2021).

4. M.B. Bachli, L. Sedeño, **J.K. Ochab** et al., *Evaluating the reliability of neurocognitive biomarkers of neurodegenerative diseases across countries: A machine learning approach*, NeuroImage 208, 116456 (2020).

5. E. Gudowska-Nowak, M.A. Nowak, D.R. Chialvo, **J.K. Ochab**, Tarnowski, *From Synaptic Interactions to Collective Dynamics in Random Neuronal Networks Models: Critical Role of Eigenvectors and Transient Behavior,* Neural Computation 32: 395–423 (2020).

6. K. Kotowski, K. Stapor and **J.K. Ochab**, *Deep Learning Methods in Electroencephalography*. In G.A. Tsihrintzis and L.C. Jain (eds), Machine Learning Paradigms: Advances in Deep Learning-based Technological Applications, of Learning and Analytics in Intelligent Systems, pp. 191–212. Springer (2020).

7. **J.K. Ochab**, W. Tarnowski, M.A. Nowak, D.R. Chialvo, *On the pros and cons of using temporal derivatives to assess brain functional connectivity*, NeuroImage 184, 577-585 (2019).

8. G. Franzini, M. Kestemont, G. Rotari, M. Jander, **J.K. Ochab**, E. Franzini, J. Byszuk, J. Rybicki, *Attributing authorship in the noisy digitized correspondence of Jacob and Wilhelm Grimm*, Front. Digit. Humanit. 5:4 (2018).

9. E. Gudowska-Nowak, **J.K. Ochab** et al., *Seeking a fingerprint: analysis of point processes in actigraphy recording*, J. Stat. Mech., 054034 (2016).

10. **J.K. Ochab**, *Reinventing the Triangles: Rule of Thumb for Assessing Detectability*, IEEE/Signal-Image Technology & Internet-Based Systems (SITIS), 2015 11th International Conference on. IEEE Computer Society; DOI:10.1109/SITIS.2015.44.

11. **J.K. Ochab**, *Stylometric networks and fake authorships*, Leonardo 50, 502 (2017).

12. D.R. Chialvo, A.M. Gonzalez Torrado et al., *How we move is universal: Scaling in the average shape of human activity*, Papers in Physics 7, 070017 (2015).

13. **J.K. Ochab**, H. Nagel, W. Janke, B. Waclaw, *A simple non-equilibrium, statistical-physics toy model of thin-film growth*, J. Stat. Mech., P09013 (2015).

14. **J.K. Ochab**, J. Tyburczyk, et. al, *Scale-free fluctuations in behavioral performance: Delineating changes in spontaneous behavior of humans with induced sleep deficiency*, PLoS One, e107542 (2014).

15. **J.K. Ochab**, Z. Burda, *Maximal entropy random walk in community detection*, Eur. Phys. J-Spec. Top. 216, 73-81 (2013).

16. **J.K. Ochab**, *Maximal-entropy random walk unifies centrality measures*, Phys. Rev. E 86, 066109 (2012).

17. **J.K. Ochab**, *Maximal Entropy Random Walk: solvable cases of dynamics*, Acta Phys. Pol. B 43, 1143 (2012).

18. **J.K. Ochab**, Z. Burda, *Exact solution for statics and dynamics of Maximal Entropy Random Walk on Cayley trees*, Phys. Rev. E 85, 021145 (2012); DOI:10.1103/PhysRevE.85.021145.

19. **J.K. Ochab**, P.F. Góra, *Shift of percolation thresholds for epidemic spread between static and dynamic small-world networks*, Eur. Phys. J. B 81, 373–379 (2011).

20. **J. Ochab**, P.F. Góra, *Synchronization of coupled oscillators in a local one-dimensional Kuramoto Model*, Acta Phys. Pol. B, Proc. Supp. 3, 453 (2010).

21. **J. Ochab**, *Test of shower reconstruction procedures with the IceTopA, IceTopB subarrays* (unpublished; a report from DESY Summer Student Programme); http://www-zeuthen.desy.de/students/2007/doc/ochab.ps