DANIEL CZECH

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https://github.com/danielczech

EXPERIENCE

2023–pres. - **Project Engineer**, Breakthrough Listen's Technosignature Survey at MeerKAT, Breakthrough Listen/University of California, Berkeley.
- Wrote software for custom high-performance computing clusters with 100+ GPU nodes and petabyte-scale storage to automate commensal technosignature searches for Breakthrough Listen.

2019–2022 - **Postdoctoral Scholar**, Breakthrough Listen/University of California, Berkeley.
- Contributed to the development of both classical and ML-based narrowband radio signal detectors.
- Developed and implemented target selection algorithms for radio telescope arrays.

2016 - **Research Internship (neuromorphic engineering),** Singapore Institute for Neurotechnology, National University of Singapore (3 months).
- Designed a novel approach for evaluating noise filtering algorithms for silicon retina sensors.
- Contributed to a Python software library to manipulate raw data from silicon retina sensors.
- Supervisor: Dr. Garrick Orchard.

2013 - **Summer Research Program (computational neuroscience),** Queensland Brain Institute, University of Queensland, Australia (3 months).
- Wrote MATLAB software to detect neuron firing patterns in calcium imaging videos of Zebrafish.
- Awarded a scholarship (top ranked student: academic merit and research potential).
- Supervisors: Prof. G. Goodhill and Dr. L. Avitan.

EDUCATION

2014–2019 - **Ph.D. (Electrical Engineering)**, Radar Remote Sensing Group (RRSG), University of Cape Town.
- Topic: Time Domain Classification of Transient Radio Frequency Interference.
- Supervisors: Prof. M. Inggs and Dr. A. Mishra.
- Awarded a South African Square Kilometer Array bursary for postgraduate study.

2010–2013 - **B.Sc. Engineering (Mechatronics)**, University of Cape Town, first class honours.
- Class medal: Mechatronics (top student in 2nd year).
- Class medal: Engineering 1 (top student in module).
- Vice Chancellor's Scholarship (1st year).

SKILLS

- **Languages:** Python (and many libraries), Bash, MATLAB, SQL, web development (JS, HTML, CSS), some C.
- **Libraries and tools:** Keras (using Tensorflow), Git, Vim, SLURM, Redis, Circus, Singularity (containerisation), Amazon Web Services, casper FPGA toolflow, basic RF front-end design, LaTeX.
- High performance computing and networking (custom computing and storage clusters; experience with hardware constraints and trade-offs).

WORKSHOPS AND COURSES

2018 - **CASPER Hardware Porting Workshop,** South African Radio Astronomy Observatory (SARAO).

2017 - **NSF Telluride Neuromorphic Cognition Engineering Workshop,** Telluride, CO (3 weeks).

2014–2017 - **Elective courses:** Advanced Engineering Mathematics, German Language, Neural, Fuzzy & Evolving Systems (University of Cape Town), and Neural Networks and Deep Learning (Coursera).

2014 - **4th IUCAF Spectrum Management School,** Santiago, Chile.

OTHER EXPERIENCE

2017–2022 - **Supervision:** Supervision of undergraduate REU students (UC Berkeley) and undergraduate senior research projects (University of Cape Town).

2017–2021 - **Lecturing:** Courses incl. Data Science for Astronomy (University of Cape Town), the 2019 African Radio Interferometry Winter School, and the SA Radio Astronomy Observatory E-Learning Platform.

2018, 2021 - **Reviewing:** Radio Science and The Astronomical Journal.

2015–2016 - **Entrepreneurship:** Designed, built and operated an automated breakfast cereal vending machine.

RESEARCH (selected publications - see Google Scholar for a complete list)

2023 - Ma, P., Ng, C., Rizk, L., Croft, S., Siemion, A., Brzycki, B., **Czech, D.** et al., 2022. **A deep-learning search for technosignatures from 820 nearby stars.** *Nature Astronomy 7, pp.492–502.*

2022 - Gajjar, V., LeDuc, D., Chen, J., Siemion, A.P., Sheikh, S.Z., Brzycki, B., Croft, S., **Czech, D.** et al., 2022. **Searching for broadband pulsed beacons from 1883 stars using neural networks.** *Accepted for publication in The Astrophysical Journal.*

2021 - **Czech, D.**, Isaacson, H., Pearce, L., Cox, T., Sheikh, S., Brzycki, B., et al., 2021. **The Breakthrough Listen Search for Intelligent Life: MeerKAT Target Selection.** *Publications of the Astronomical Society of the Pacific 133(1024),* p.064502.

- Sheikh, S.Z., Smith, S., Price, D.C., DeBoer, D., Lacki, B.C., **Czech, D.J.** et al., 2021. **Analysis of the Breakthrough Listen signal of interest blc1 with a technosignature verification framework.** In *Nature Astronomy, 5(11),* pp.1153-1162.

- Smith, S., Price, D.C., Sheikh, S.Z., **Czech, D.J.**, Croft, S., DeBoer, D. et al., 2021. **A radio technosignature search towards Proxima Centauri resulting in a signal of interest.** In *Nature Astronomy, 5(11),* pp.1148-1152.

- Price, D.C., MacMahon, D.H., Lebofsky, M., Isaacson, H., Sheikh, S., **Czech, D.**, Gajjar, V., Siemion, A., Drew, J., Worden, S.P. and Green, J.A., 2021. **Expanded Capability of the Breakthrough Listen Parkes Data Recorder for Observations with the UWL Receiver.** *Research Notes of the AAS, 5(5),* p.114.

- Hawkins, M.W., **Czech, D.J.**, MacMahon, D.H., Croft, S. and Siemion, A.P., 2021. **High-Performance Radio Telescope Array Data Processing Framework.** In *XXXIVth General Assembly and Scientific Symposium of the International Union of Radio Science (URSI GASS)* (pp. 1-4). IEEE.

2020 - Brzycki, B., Siemion, A.P., Croft, S., **Czech, D.**, DeBoer, D., DeMarines, J., et al., 2020. **Narrowband Signal Localization for SETI on Noisy Synthetic Spectrogram Data.** *Publications of the Astronomical Society of the Pacific, 132(1017),* p.114501.

2019 - Lebofsky, M., Croft, S., Siemion, A.P., Price, D.C., Enriquez, J.E., Isaacson, H., MacMahon, D.H., Anderson, D., Brzycki, B., Cobb, J., **Czech, D.**, DeBoer, D., et al., 2019. **The Breakthrough Listen Search for Intelligent Life: Public Data, Formats, Reduction, and Archiving.** *Publications of the Astronomical Society of the Pacific, 131(1006).*

2018 - **Czech, D.**, Mishra, A. and Inggs, M., 2018. **A CNN and LSTM-based Approach to Classifying Transient Radio Frequency Interference.** *Astronomy and Computing, 25,* pp. 52-57.

- **Czech, D.**, Mishra, A. and Inggs, M., 2018. **A Dictionary Approach to Identifying Transient RFI.** *Radio Science, 53(5),* pp. 656-669.

2017 - **Czech, D.**, Mishra, A. and Inggs, M., 2017. **Characterizing Transient Radio-Frequency Interference.** *Radio Science, 52(7),* pp. 841-851.

2016 - **Czech, D.** and Orchard, G., 2016. **Evaluating Noise Filtering for Event-based Asynchronous Change Detection Image Sensors.** In *Biomedical Robotics and Biomechatronics (BioRob), 2016 6th IEEE International Conference on* (pp. 19-24). IEEE.

- **Czech, D.**, Mishra, A. and Inggs, M., 2016. **Identifying Radio Frequency Interference with Hidden Markov Models.** In *Radio Frequency Interference (RFI)* (pp. 21-25). IEEE.