Expectation-Maximization for Scheduling Problems in Satellite Communication

Werner Bailer, Martin Winter, Johannes Ebert, Joel Flavio, Karin Plimon

CONTACT

JOANNEUM RESEARCH
Forschungsgesellschaft mbH

DIGITAL – Institute for
Information and
Communication Technologies

Werner Bailer

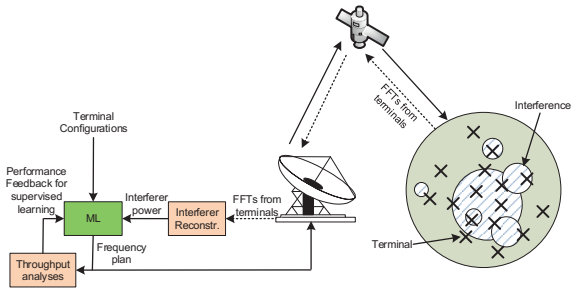
Steyrergasse 17
8010 Graz

Phone +43 316 876-5000
werner.bailer@joanneum.at
www.joanneum.at/digital

Use Case: Ka-band frequency plan optimization

Results compared against baselines:

- ESS only: using only the exclusive band without interferers (lower bound)
- w/o interferers A: minimum number of carriers in shared band (SSS), distributing the available bandwidth and terminals equally (assuming no interferers)
- w/o interferers B: best carrier configuration found using the proposed method (assuming no interferers)



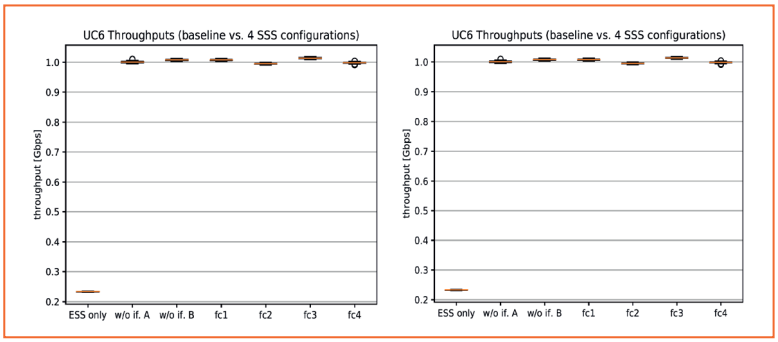


Figure: Throughputs for baselines and determined frequency plans (fc1-fc4).

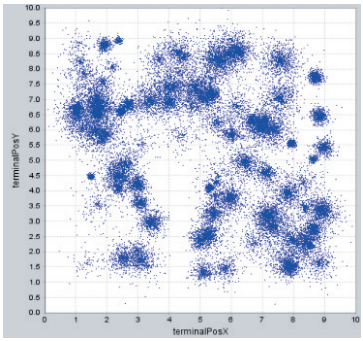


Figure: Sample terminal distribution

Use Case: Dynamic configuration of an active antenna array satellite

- Non-uniform distribution of terminals/traffic demands dynamic setup
- Size and position of spot beams are flexible
- Find optimal beam setup

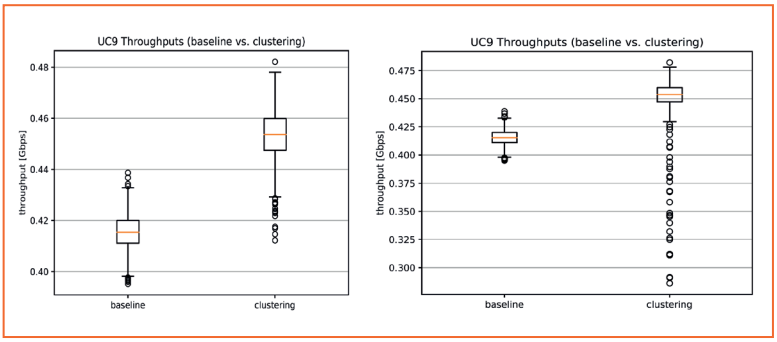


Figure: Throughputs of baselines and determined beam configurations.

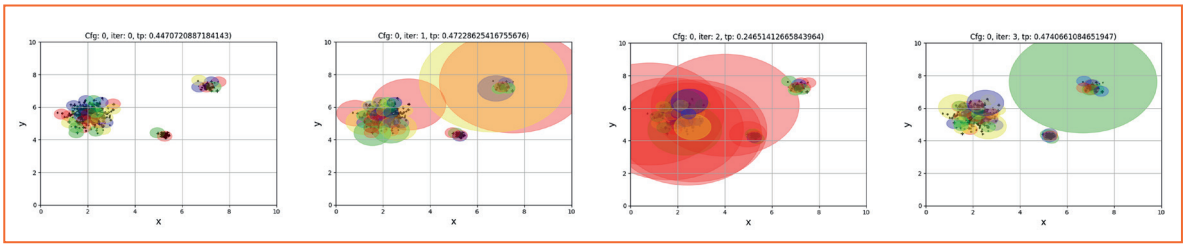


Figure: Evolution of the beam configuration during convergence of the EM algorithm.

Acknowledgement

This work was carried out within the ARTES FP programme of, and funded by, the European Space Agency under the contract No. 4000127103/19/UK/AB – Machine learning and artificial intelligence for satellite communications.

The view expressed herein can in no way be taken to reflect the official opinion of the European Space Agency.