

# Bachelor's / Master's Thesis:

## Constellation Shaping for Optical Satellite Links

Satellites have become a vital technology in providing internet connectivity to remote places. Optical satellite communication systems offer high data rates, low latency, and higher security than their radio-frequency-based counterparts. However, ground-to-satellite connections face various challenges, such as fading due to atmospheric turbulence and a narrow field of view, potentially leading to severe fluctuations in the power of the received communication signal. Accordingly, reliable data transmission over optical ground-to-satellite links is challenging. Whereas the constellation points in traditional digital modulation formats such as PAM or QPSK feature uniform distributions, the constellation arrangement in shaped constellations is altered to increase the reliability and throughput of the communication system.

### Your tasks could comprise:

- Conducting a literature review on optical satellite links & constellation shaping
- Comparing different shaping approaches for digital signal modulation
- Implementing modulators & demodulators for shaped constellations in MATLAB or Python
- Verifying the functionality of the (de)modulators in the lab

### Interested?

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