

MA

Deployment of Robust Neural Video Compression for Autonomous Driving

Neural video compression is an emerging research field that is quickly gaining traction as alternative to standardized hand-crafted video codecs. Modern neural codecs are capable of exceeding performance of existing state-of-the-art standard codecs. Recently real-time capable neural architectures were introduced, proving the ability to deploy them in real-time scenarios on modern hardware.

Current neural codecs exhibit vulnerability to transmission errors and lack sophisticated rate control mechanisms required for practical deployment under variable network conditions. Packet loss causes catastrophic quality degradation due to temporal prediction dependencies, while existing rate control approaches fail to maintain consistent quality under bandwidth fluctuations.

The goal of this work is to extend an existing real-time neural video codec with learned error correction and rate control mechanisms, implement hierarchical packet coding for robust transmission, and deploy the system on the EDGAR research vehicle.

Work Packages:

Implementation of learned forward error correction using reinforcement learning agents for adaptive redundancy allocation

- Development of rate control mechanism via deep reinforcement learning to maintain target bitrate while maximizing perceptual quality
- Design of hierarchical packet coding scheme with progressive quality layers for graceful degradation
- Integration and deployment on EDGAR vehicle hardware with network simulation for various channel conditions
- Optimization via TensorRT or comparable acceleration libraries for inference efficiency
- Comparative evaluation against algorithmic rate control methods and standard forward error correction schemes

Requirements:

- Programming experience with Python and well versed with Pytorch
- High personal motivation and independent working style.
- Very good language proficiency in German, English

Kontakt:

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Lehrstuhl für Fahrzeugtechnik | Prof. Dr. Markus Lienkamp

Recommended Literature:

1. [Nonlinear Transform Coding](#)
2. [End-to-End Neural Video Compression: A Review](#)
3. [DCVC-RT](#)
4. [GRACE](#)

This work can also be completed in German.

If you are interested or have any questions, please send me an e-mail with your CV and a current transcript of your records, thank you!

The paper should document the individual steps in a clear and concise manner. The candidate undertakes to complete the term paper independently and to indicate the academic resources used.

The submitted paper remains the property of the chair as an examination document.

Prof. Dr.-Ing. M. Lienkamp

Betreuer: Niklas Krauß, M. Sc.

Ausgabe: _____

Abgabe: _____

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