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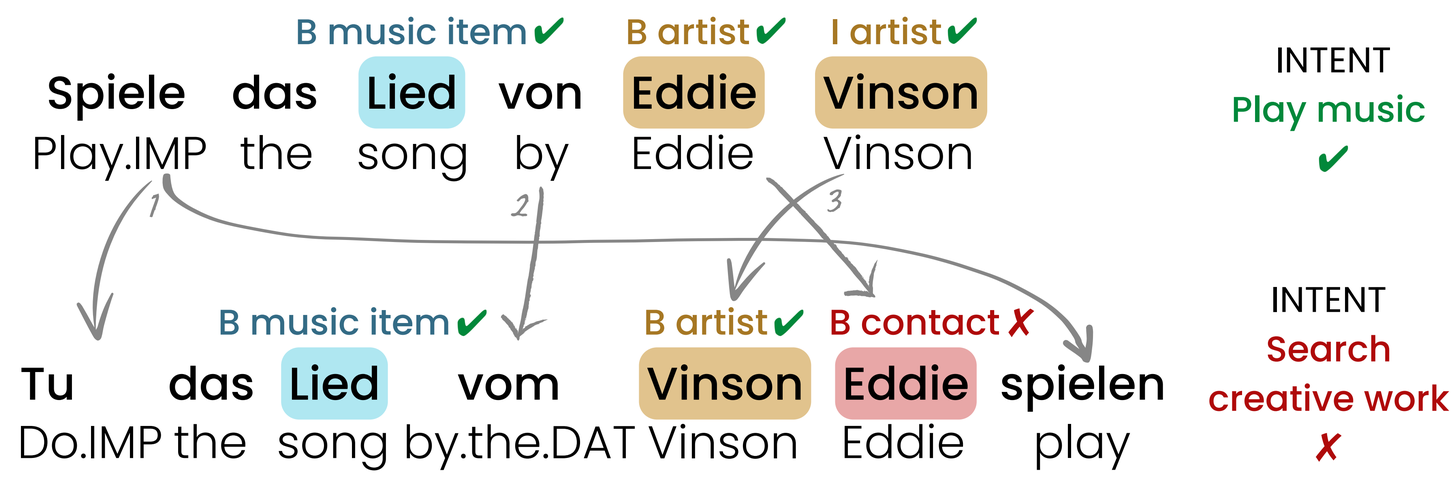
Exploring the Robustness of Task-oriented Dialogue Systems for Colloquial German Varieties

Typical set-up: train a model on ENG intent recognition + slot-filling and apply it zero-shot to other languages.
What about lower-resource colloquial varieties with limited test data?



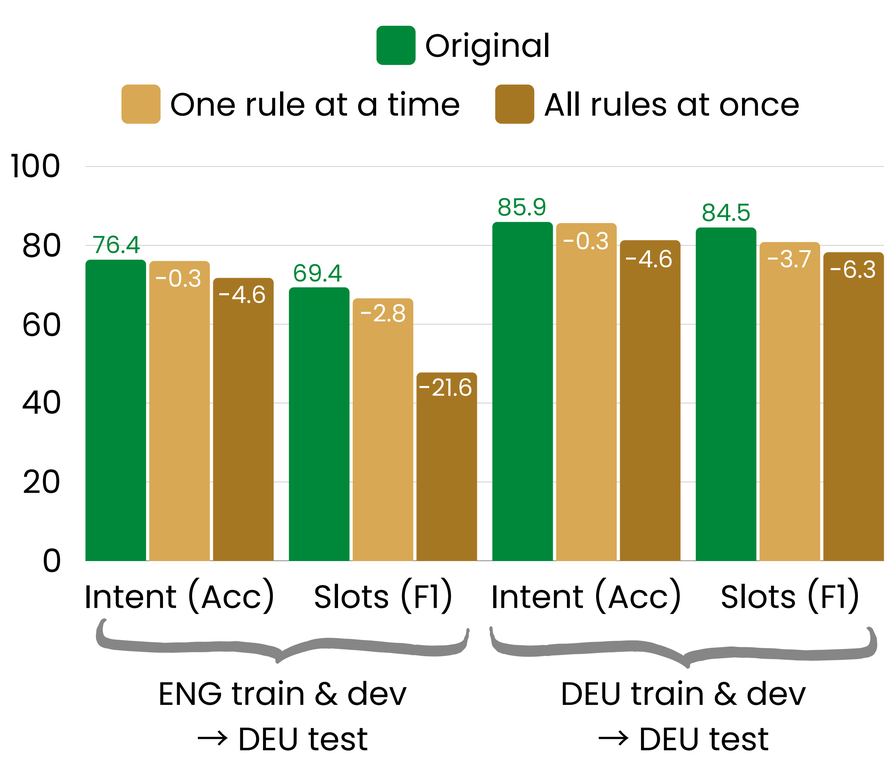
1 Periphrastic imperative with auxiliary *tun* ("do")
2 Article before personal names (here merged with apposition)
3 Swapped order of given and family name

Method

- 18 handcrafted and validated morphosyntactic perturbation rules for German dialects & colloquial varieties (inspired by Ziems et al. 2023) targeting
  - genitive constructions
  - personal names
  - verb clusters
  - prepositions
  - relative sentences
  - & more
- 4 datasets: xSID, MultiATIS++, MASSIVE, MTOP
- 5 multilingual LMs: mBERT, XLM-R, RemBERT, mDeBERTa, DistilmBERT, mMiniLM
- Training: joint intent recognition and slot-filling, 5 random seeds

How does the LMs' performance change when applied to synthetic colloquial data?

- Intent recognition (sentence-level): robust
- Slot-filling (word-level): brittle, especially when multiple perturbations are applied at once



Which perturbations have the most significant effect? What kinds of errors do we get?

Intent recognition
- Biggest impact: swapping first/last name
- Confusion between intents with similar meanings or similar associated terms

Slot filling
- Biggest impact: changes to the word order → issues with slot boundaries
- In MultiATIS++ (travel-planning), changes to direction/location prepositions are impactful → incorrect slot types
- Extra slot labels get assigned when words are added (e.g. in periphrastic verb constructions)

Rarely seen dialect phenomena deceive models more effectively

Which LMs are the most/least robust?

All models are affected!
- Best across the board: mDeBERTa, RemBERT
- Sometimes competitive: XLM-R
- Worst: mBERT, DistilmBERT, mMiniLM

Conclusion

Linguistic variation has an effect on slot/intent detection performance, even when only morphosyntax is concerned!
Future work: what if we also change lexis & pronunciation?

For additional details, check out the paper & code!

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