Nonmanual Marking of Questions in Balinese Homesign Interactions:
A Computer-Vision Assisted Analysis

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Question marking in homesign

Homesign: a visual-gestural communication system co-created by a deaf person without access to a conventionalized language and their interlocutors

Question marking in sign languages:

- Manual question signs
- Nonmanual markers
  - Head movements
  - Eyebrow movements

Research questions

1. What are nonmanual markers of questions in 5 Balinese homesigner interactions?
2. Do different question types have distinct marking patterns?
3. Can we use Computer Vision to study the nonmanuals?

The data

- Balinese Homesign Corpus
- 5 deaf homesigners in interaction with 4 hearing and 1 deaf interlocutor
- 296 instances of questions annotated
  - Polar/Open/Content/huh?
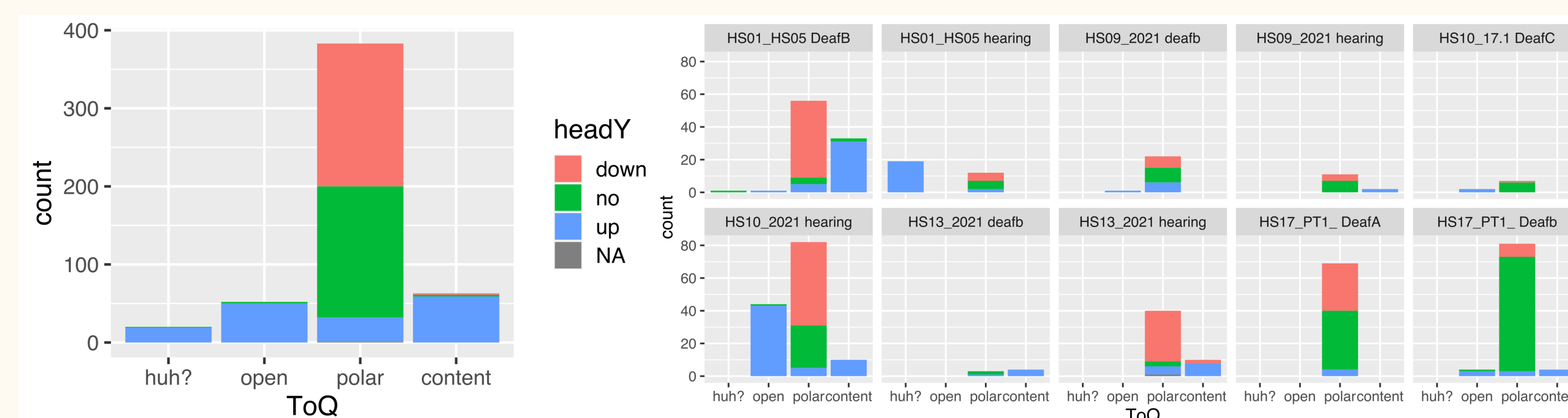- Manual annotation of nonmanuals

Computer Vision

- OpenFace 2.0 (Baltrusaitis et al. 2018) measures head rotation
- Head tilts and nods: pitch
- Measurements: average pitch across conditions

Limitations

- Complex head movements not considered
- Small and unbalanced dataset
- Precision of OpenFace measurements

Descriptive results

- No consistent pattern of eyebrow movement use for questions
- Surprisingly consistent relation between head movement and question type across the participants

Computer Vision results

- Agreement between manual annotation for head movement direction and OpenFace measurements
- Clear relation between question type and OpenFace measurement of head pitch
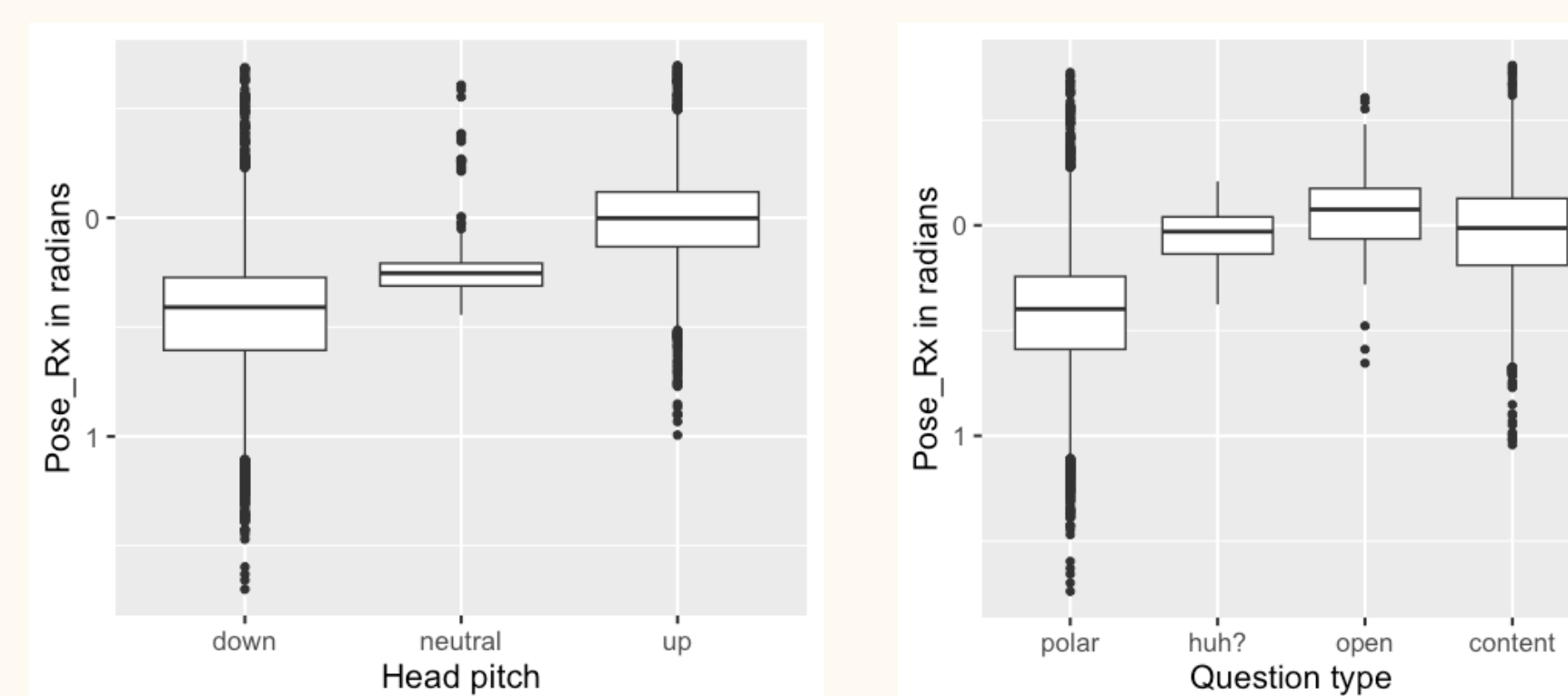
Head movement as dynamic patterns

- Tested discovery of patterns in noisy data via LOESS smoothing, kernel regression, and splines
- All methods deliver good results, but further fine-tuning is required to distinguish linguistically relevant motion
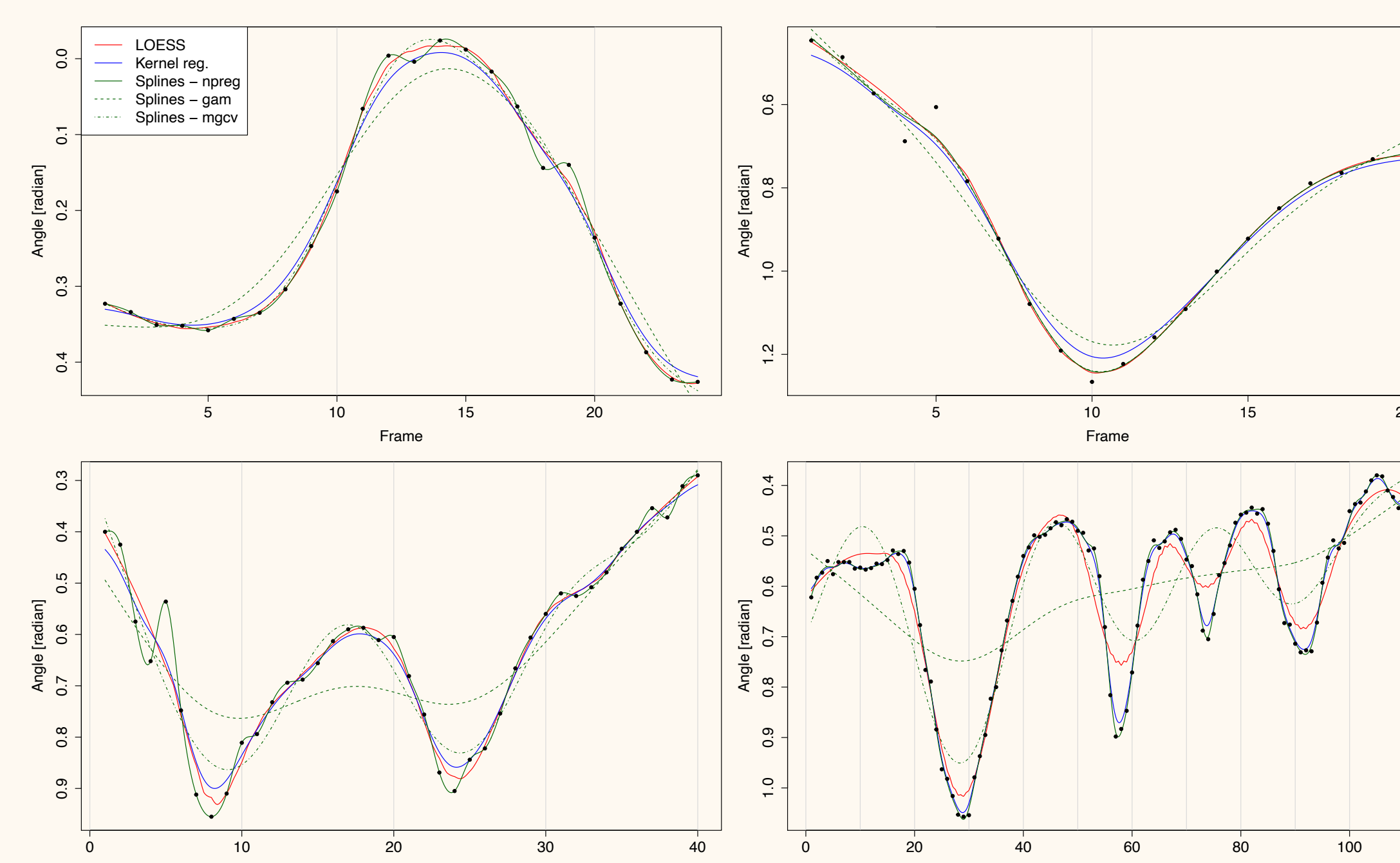
Outlook

- Cross-linguistic comparison
- Improved Computer Vision solutions
- Further statistical measures and analysis
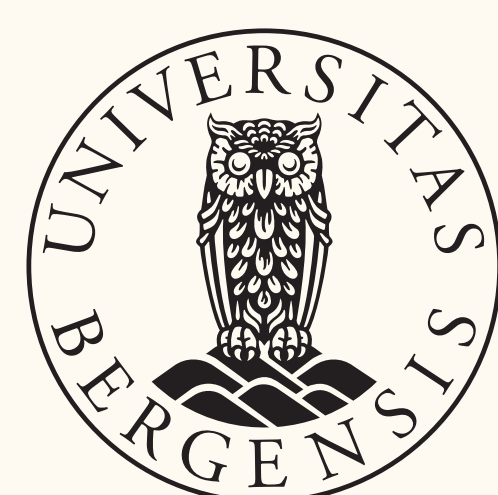
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