Multi-task Learning of Social Psychology Assessments and Nonverbal Features for Automatic Leadership Identification

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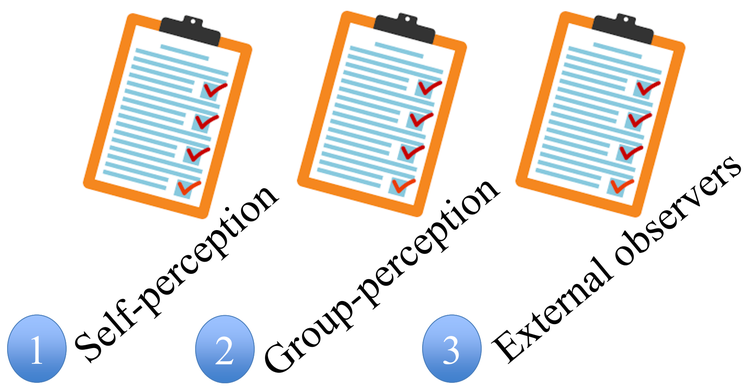
www.iit.it/pavis/datasets/leadershipCorpus

MOTIVATION

- Leadership is a multi-dimensional construct: from self-evaluation to analysis of interpersonal dynamics [1].
- Psychological research has approached the leadership with three main assessments:



- Each is informative and contributes to understanding effective leadership. But utilizing them alone can fail to understand the whole picture [2].
- ***Can joint modeling of multiple assessments perform better than modeling each assessment separately for the automatic prediction of (non) leaders?***
- Proposal: Automatic identification of the designated leaders in small-group meetings using Multi-Task Learning (MTL)
- *Tasks:* Social Psychology Assessments and
- *Nonverbal features:*
  - NF1: Concatenation of Visual Focus of Attention (VFOA) and Speaking Activity
  - NF2: VFOA while Speaking Activity.

DATASET

- 12 meetings (12-30 minutes).
- **Video:** 4 frontal cameras and a standard camera.
- **Audio:** 4 wireless lapel microphones.
- **Survival Task**

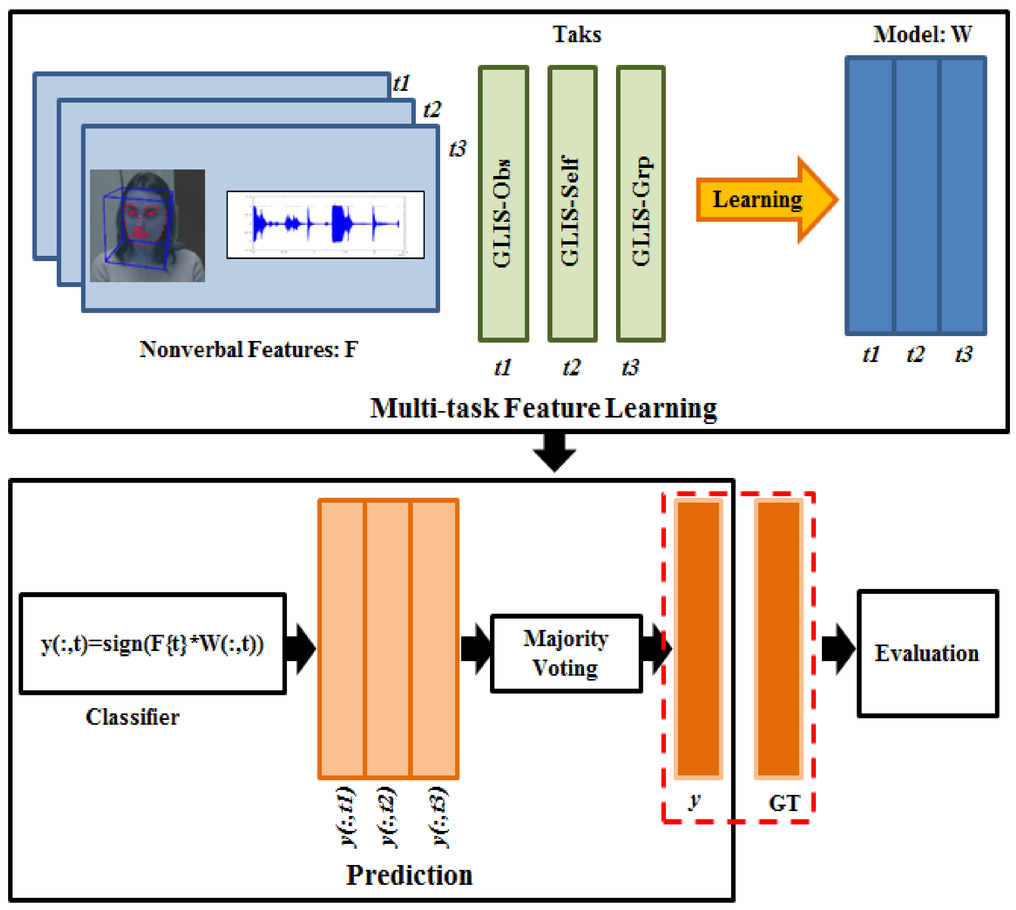
Publicly Available

- **Designated leaders:** Ground-truth data (GT)
  - Based on SYstematic method for the Multiple Level Observation of Groups
  - Participant having scores of dominance and task-orientation > the median of the corresponding scores.
- **General Leader Impression Scale (GLIS):** Showing participant's contribution to the group's overall effectiveness on the task.
- The highest the value of GLIS, the highest the leadership attribution in a group task [3].
  - Self-Perception (GLIS-Self)
  - Group-Perception (GLIS-Grp)
  - External Observers (GLIS-Obs)
  - GLIS-All (fusion of all)

Agreement between ground-truth and different assessments

	GLIS-Self	GLIS-Grp	GLIS-Obs	GLIS-All
Leader	84%	59%	67%	75%
Not-Leader	95%	87%	89%	95%

PROPOSED METHOD



- **Multi-Task Feature Learning (MTFL) [4]:**
  - Tasks share the same feature space.
  - 3 seperate tasks, jointly learnt, results in 3 models/predictions.
  - 3 predictions are combined using majority voting to find the final class (leader or not leader).
- GT data was not used during training.
- Evaluation: GT vs. final class

Detection Rate	Leader	Not Leader
GLIS-Self-NF1/NF2	**1.00**/0.83	0.59/0.73
GLIS-Grp-NF1/NF2	0.84/0.67	0.50/0.75
GLIS-Obs-NF1/NF2	0.92/0.75	0.53/0.70
GLIS-All-STL-NF1/NF2	**1.00**/0.75	0.62/0.73
GT-NF1/NF2	**1.00/1.00**	0.67/0.64
[6]-NF1/NF2	0.59/0.59	**0.92/0.89**
[5]-NF1/NF2	0.67/0.67	**0.92/0.89**
GLIS-All-MTFL-NF1/NF2	**1.00**/0.84	0.64/0.78

Proposed method (GLIS-All-MTFL), Single Task Learning (STL; GLIS-Self, GLIS-Grp, GLIS-Obs), majority voting applied to all STLs (GLIS-ALL-STL), GT as a task of STL.

- ***Different assessments of leadership can be utilized jointly by using MTFL and this results in better leadership identifications as compared to modeling them individually.***

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