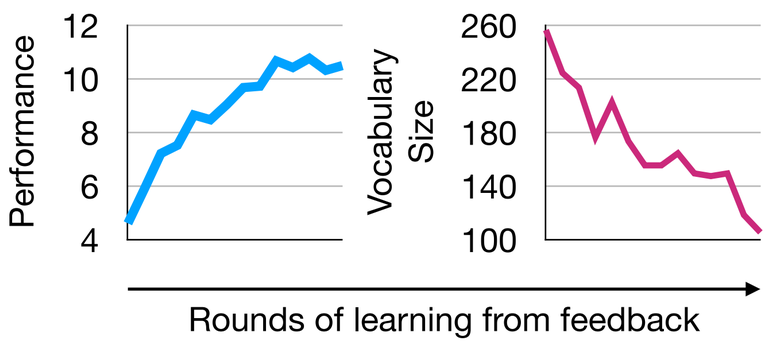
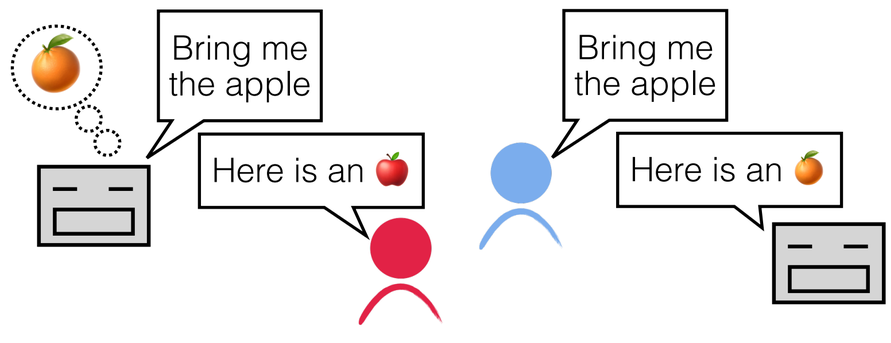
CoGen: Learning from Feedback with Coupled Comprehension and Generation

Mustafa Omer Gul and Yoav Artzi

Models learning from feedback often train on own outputs, trading diversity for performance

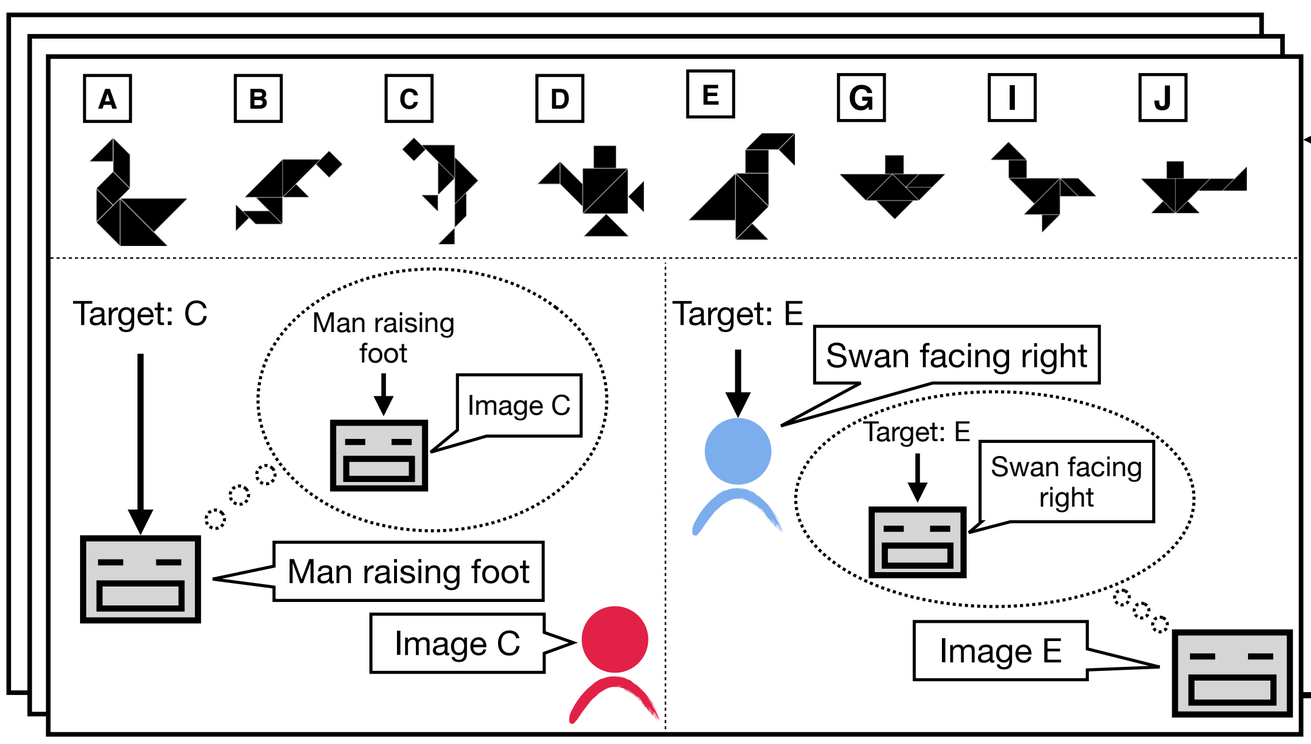


But: models often generate *and* comprehend language in deployment



Can coupling comprehension and generation change this trade off?

- **How does coupling influence models' generated language?**
- **What impact does coupling have on model performance?**
- **How does this influence change over the system's lifetime?**
- Theories of cognition (Pickering and Garrod, 2013) suggest this can be impactful



Long-term study of coupling dynamics in a continual learning setting, alternating between deployment and training

Coupled Deployment: Joint Inference

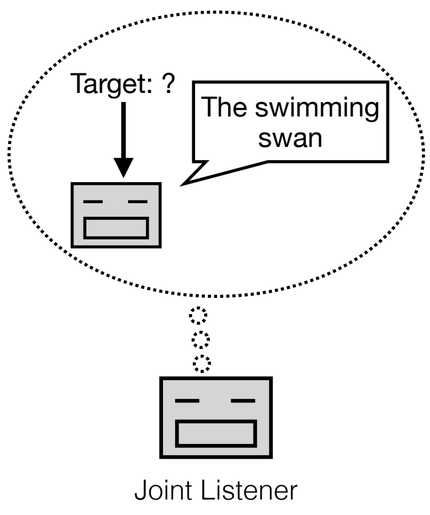
- Approximate Rational Speech Acts framework (Fried et al, 2018) for coupling

Joint distribution $\propto$ $P_l(t \mid I, u)^{\lambda} \, P_s(u \mid I, t)^{1-\lambda}$

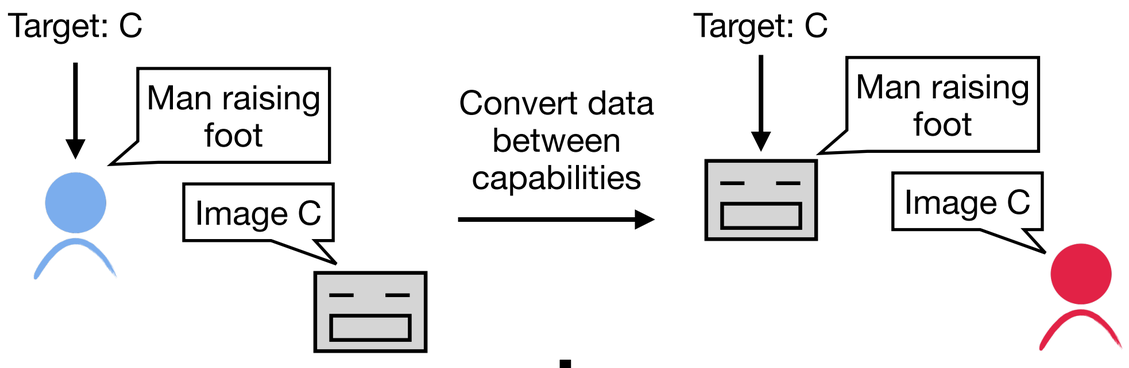
Target: Image A; **Utterance:** "The swimming swan

	P(·|context, utterance)	P(utterance|context,·)	
A	0.25	0.45	0.1125
B	0.1	0.05	0.005
C	0.1	0.02	0.002
D	0.35	0.25	0.0875

x =



Coupled Training



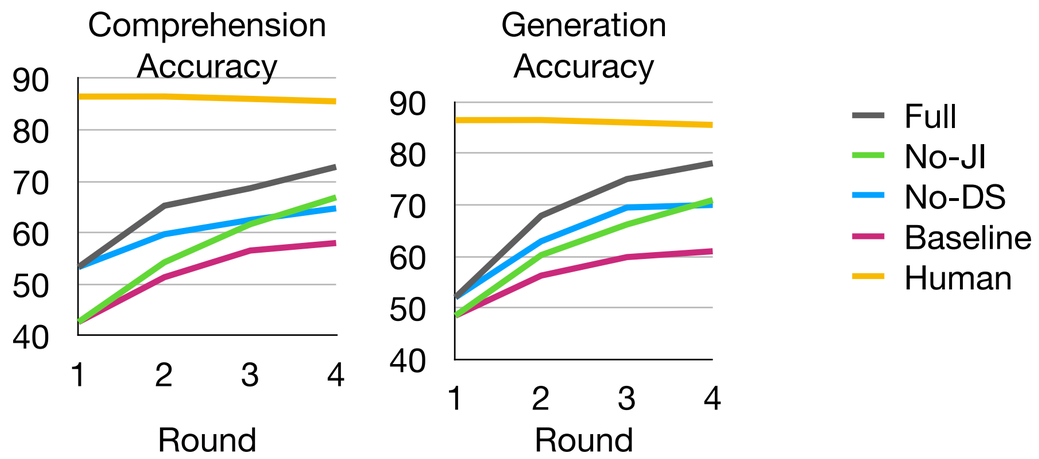
Joint training objective

$$\Delta = r_l \nabla \log P_l(\hat{t} \mid I_l, u_l; \theta) + r_s \nabla \log P_s(\hat{u} \mid I_s, t_s; \theta)$$

Deployment Results

- MTurk deployment with humans, consisting of thousands of interactions
- **Full** approach vs. ablations without joint inference (**No-JI**), data sharing (**No-DS**) or both (**Baseline**) in randomized experiment.
- Evaluation: task success and generated language

Coupling Allows for More Data Efficient Learning



Coupling Improves Lexical Diversity and Similarity to Human Language