

Ambiguity and abstractness in multi-modal models of German noun compounds and particle verbs

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Multi-Modal Models

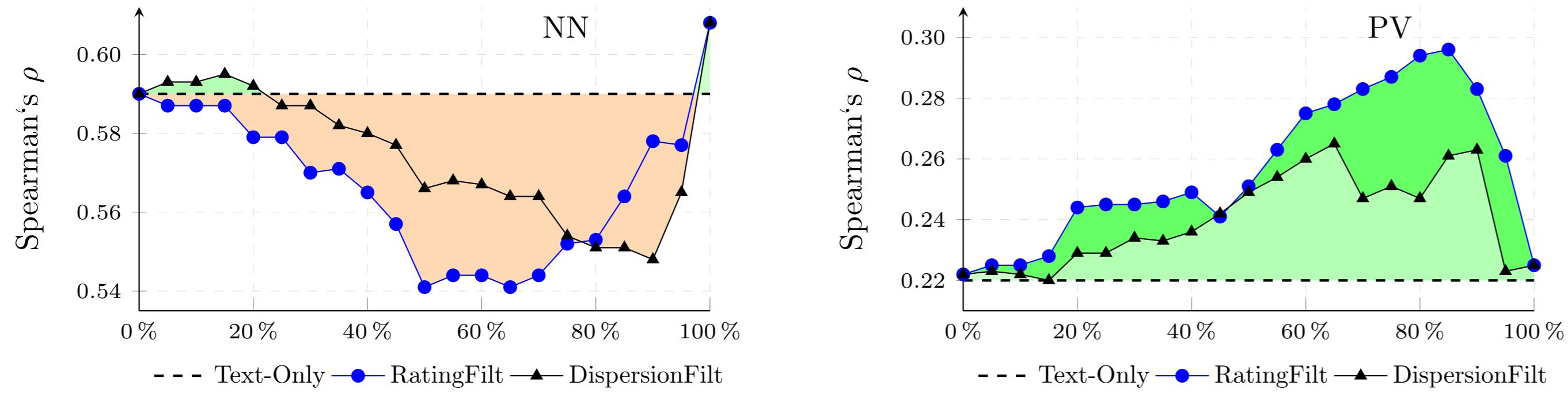
Experiment Setup

- Multi-modal model for German multi-word expressions (MWEs)
- Targets from existing gold standards:
 - 868 German noun-noun compounds (such as *Feuerwerk* ‘fireworks’), cf. Schulte im Walde et al. (LREC 2016)
 - 400 German particle verbs (such as *anstrahlen* ‘beam/smile at’) across 11 prepositional particle types, cf. Bott et al. (CogALex 2016)
- Task: predict the degree of compound–constituent compositionality
- Data:
 - textual embedding vectors: word2vec based on DECOW1.4AX (12 billion words)
 - image embedding vectors: GoogLeNet vs. AlexNet based on bing.de
- Model:
 - mid-fusion: concatenation of L2-normalised representations
 - unsupervised dispersion filter for perceptual information
 - affective norm filter for abstractness, imageability, valency

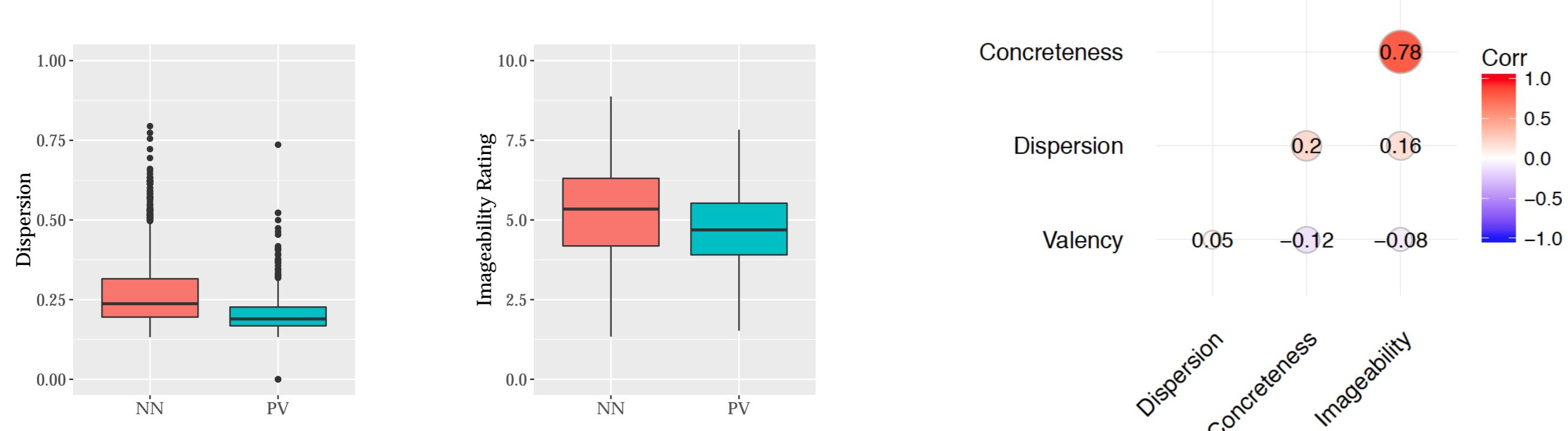
Overall Results with and without Filtering

	Text only	Images only	Text+Images	Dispersion Filter	Median Filter
PV all	0.22	0.05	0.23	0.26	0.28
NN	0.59	0.34	0.61	0.55	0.55
	Text only	Images only	Text+Images	Dispersion Filter	Median Filter
GoogLeNet	0.22	-0.04	0.21	0.19	0.29
NN	0.56	0.27	0.57	0.42	0.41

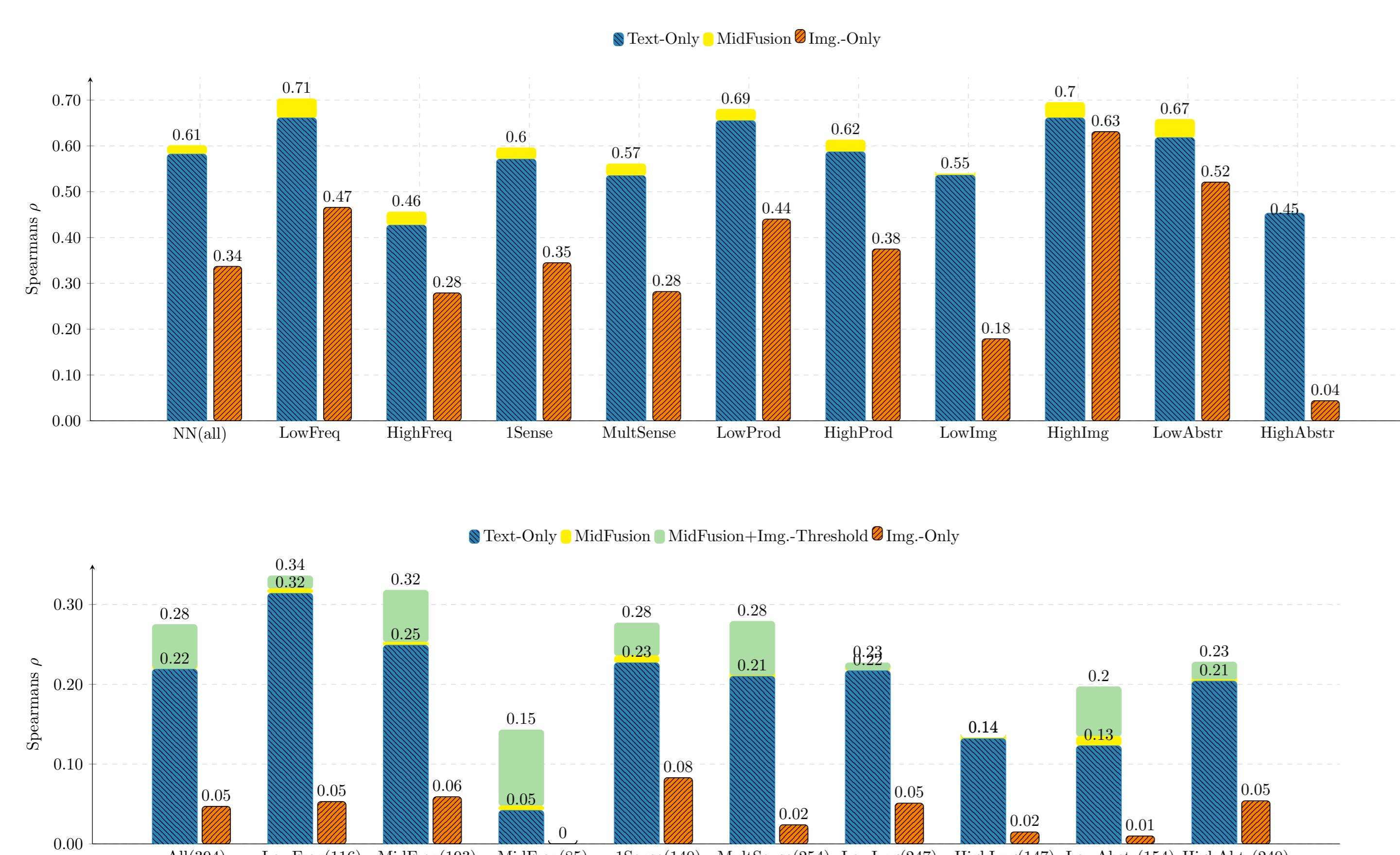
Spearman's ρ comparing Model Predictions with Ratings



Affective Norms & Dispersion across Targets



Results according to MWE Properties



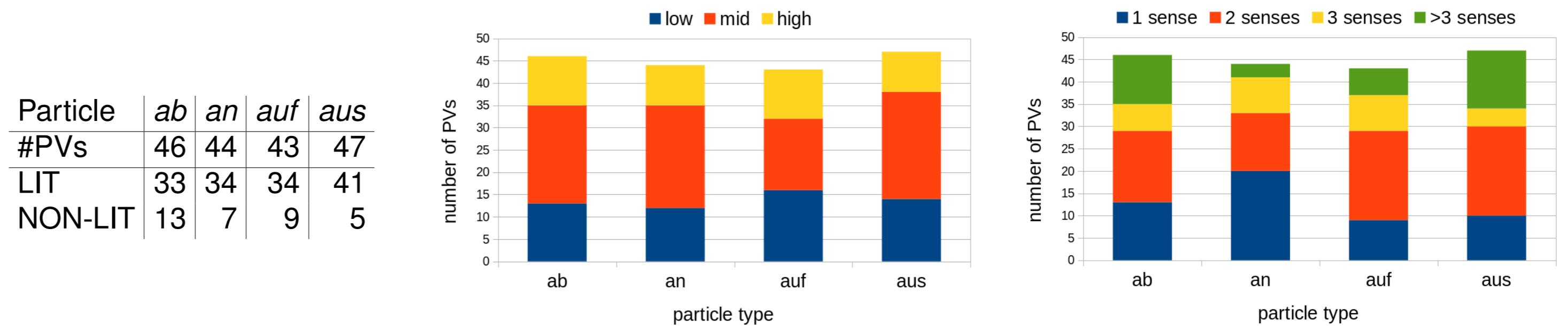
Exploring Visual Properties in the PV Models

Experiment Design

- Focus on *ab-/an-/auf-/aus-PVs*
- Amazon Mechanical Turk (AMT) experiment
- Participants read PV and see 25 PV images from bing.de (same as in model).
- Participants provide up to five free associations and select a *duden.de* sense.
- Fake targets are included to identify spammers.
- Explorations are based on preliminary results from $\approx 1,200$ labeled PV instances.

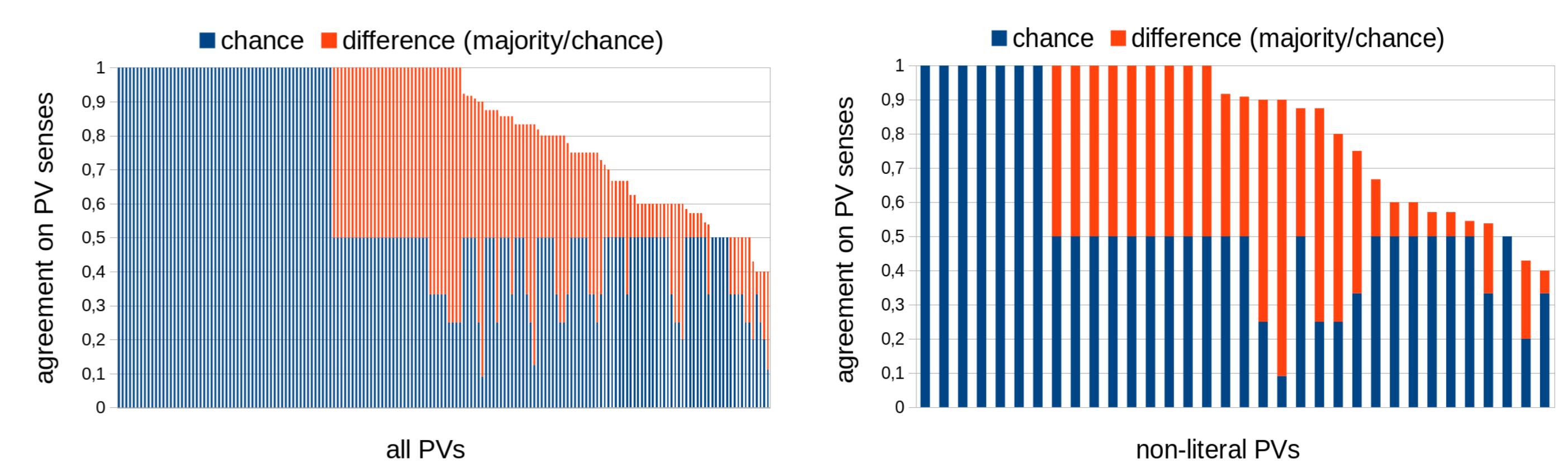


Empirical & Lexical PV Properties



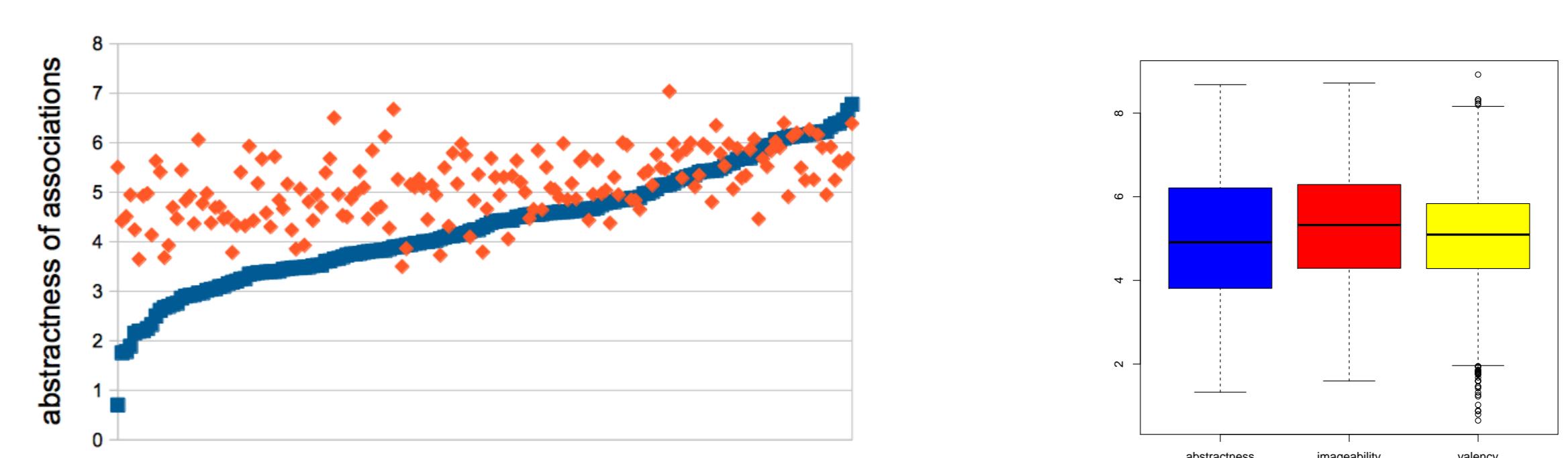
Predominant Senses in Images

- Hypothesis: Images refer to a predominant PV sense.
- Exploration: comparison of majority sense selection against chance



Abstractness in Free Associations to Images

- Hypothesis: Images refer to both abstract and concrete PV senses.
- Exploration: average degree of abstractness across all associations to a PV



- Exploration across affective norms (Pearson's correlations, $p < .001$):