

Semantic Complexity of Quantifiers and their Distribution in Corpora

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Generalized Quantifiers

some men are happy

all humans are mammals

50 MPs voted against the war in Irak

fewer than 100 violins are Stradivari

more than $2/3$ of planets are lifeless

33% of Peru's population lives in Lima

some children like each other

more than $2/3$ of female MPs sit next to each other



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} Aristotelian

} counting

} proportional

} Ramsey



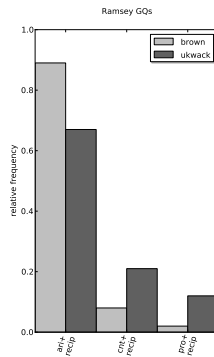
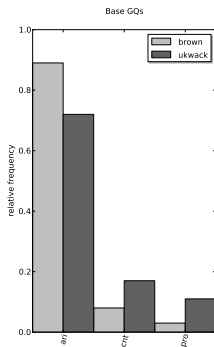
Complexity Ranking

Base Quantifiers Q	Complexity
Aristotelian (<i>ari</i>)	AC^0
counting (<i>cnt</i>)	AC^0
proportional (<i>pro</i>)	P

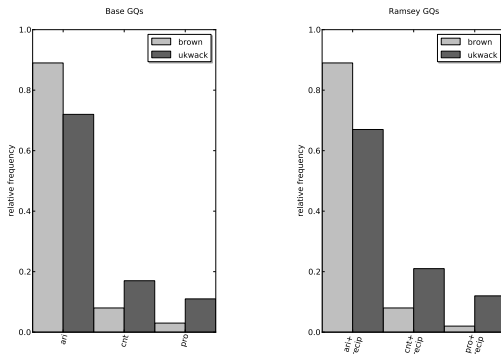
Ramseyfied Quantifiers R_Q	Complexity
Ramsey+Aristotelian (<i>ari+recip</i>)	AC^0
Ramsey+counting (<i>cnt+recip</i>)	AC^0
Ramsey+proportional (<i>pro+recip</i>)	NP-complete



Quantifier Distribution



Quantifier Distribution



- 1 Corpus distribution significantly ($p < 0.01$) biased towards tractable quantifiers
- 2 A fine-grained analysis yields power law distributions