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**WELCOME TO THE CLUB: DESIGNING THE
INVENTORY OF SEMANTIC ROLES FOR
ADJECTIVES**

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SEMANTIC ROLES AND THEIR INVENTORIES

- A key concept in both theoretical and computational tasks (semantic-syntax interface → natural language understanding).
- However: a huge diversity in the inventories of semantic roles.
- Cf. Fillmore 1968, Apresjan 1995, FrameNet...



SEMANTIC ROLES AND GRAMMATICAL CLASSES

- The existing inventories mostly deal with verbs.
- Arguments of nouns or adjectives?

dyra v polu ‘a hole in the floor’, *kofe s molokom* ‘coffee with milk’, *dalekij ot Moskvy* ‘distant from Moscow’, *izvestnyj svoimi publikacijami* ‘famous for his / her publications’

- The same role inventory for verbal and non-verbal roles or different inventories?




OBJECTIVE


- Building a role inventory for Russian adjectives.
- This has been beyond the existing research so far (cf. Arkhangelskiy et al. 2010; Kustova 2007, 2009; Rakhilina et al. 2010 on the semantics and morpho-syntax of adjectives; Shelmanov, Smirnov 2014; Kuznetsov 2016 on SRL).
- What is the empirical evidence to rely on?
- What is the “gold standard” to avoid arbitrary suggestions and to make the results verifiable for computational tasks?



OUR APPROACH

- Collecting expert judgements as the benchmark for assessing our decisions.
 - Instead of building a theory from scratch, we propose to form the opinion of the community and to see the limits of possible divergences.
 - A common practice in computational linguistics: checking to what extent the output of a machine could approximate human judgements (cf. sentiment analysis, machine translation, semantic similarity).
 - Some deviations in our approach:
 - ✓ The need to assess not the output of a system but rather the training data.
 - ✓ Judgements about semantic roles require linguistic background of the assessors.
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VERBAL ROLES: RUSSIAN FRAMEBANK

- The inventory of verbal roles as the starting point.
 - Its source: Russian FrameBank (www.framebank.ru)
- + The task to create a role inventory good for all purposes is rather vague, so we need to adopt a particular framework.
- FrameBank and its role inventory (Lyashevskaya, Kashkin 2015):
 - ✓ Russian lexical constructions mostly for verbs (ca. 4000) & corpus examples (ca. 50000), 91 semantic roles.
 - ✓ The roles correlate with the semantic classification of the lexicon & prototype and periphery (e.g. different types of Agent for destruction vs. speech vs. motion).
 - ✓ Hierarchy of roles, flexible search options.
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DESIGN OF THE SURVEY

- 20 native Russian speakers, either professional linguists or students of linguistic departments.
 - Score-assignment test.
 - The task: to rate the similarity between the target pair ADJECTIVE – ITS ARGUMENT and the control pair VERB – ITS ARGUMENT, the scale is from 1 to 7.
- + A free answer option to suggest a better variant (however it was not popular).



IV. Близкий

IV-b. Автор статьи высказывает близкие НАМ идеи.

ИВАН ПЕТРОВИЧ болеет уже несколько недель. *

1 2 3 4 5 6 7

ТЕТКА думает, что ему придется уехать. *

1 2 3 4 5 6 7

ПРОДАВЕЦ режет сыр на тонкие куски. *

1 2 3 4 5 6 7

Лиза открыла СВЕТЕ дверь. *

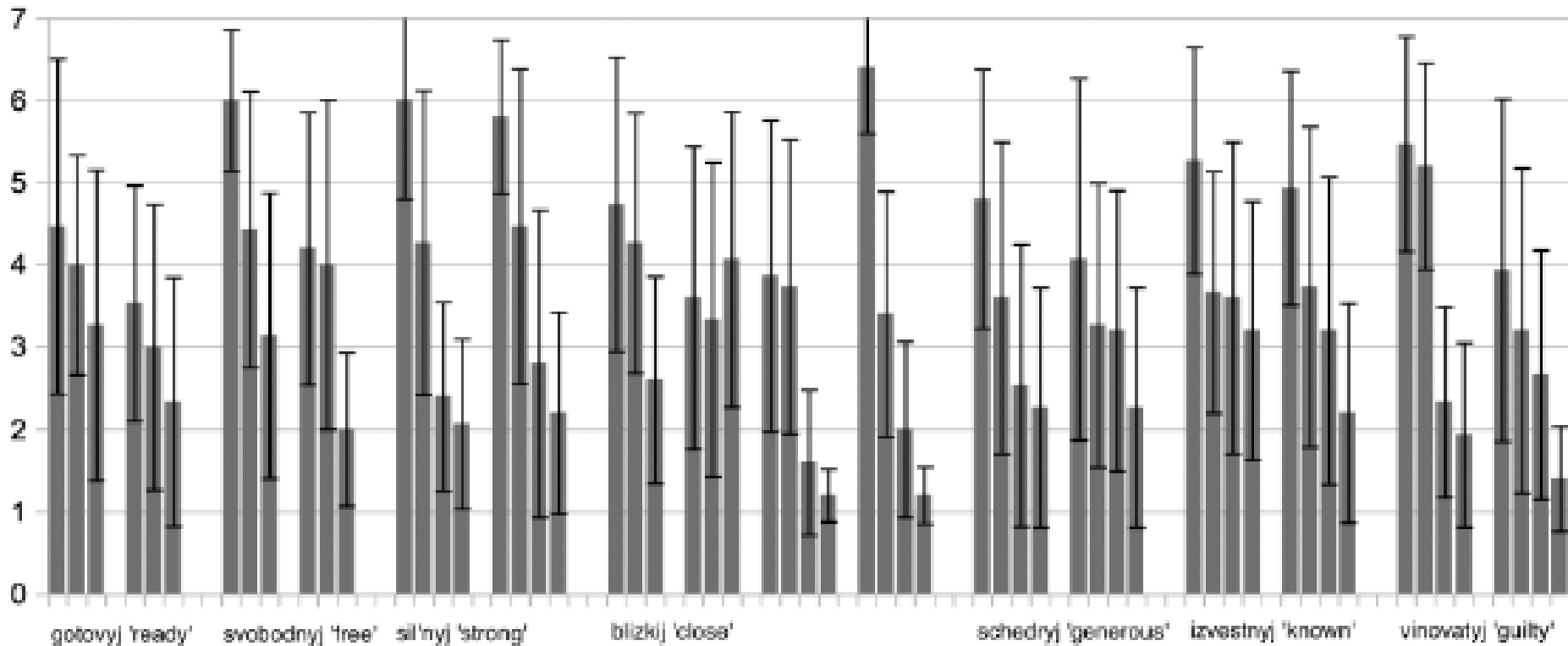
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CONTENTS OF THE SURVEY

- 16 target sentences with 7 adjectives (different meanings and valency patterns): *gotovyj* ‘ready’, *svobodnyj* ‘free (from)’, *sil'nyj* ‘strong, impressive’, *blizkij* ‘close’, *ščedryj* ‘generous’, *izvestnyj* ‘famous for, known by’, *vinovatyj* ‘guilty’
- 10 predicative and 6 attributive constructions.
- 3-4 control pairs VERB – ITS ARGUMENT after each target sentence.
- All the questions for each participant, no time limit.
- NB no universal correspondences between cognate verbs and adjectives, cf. *Ja gotov pomoč' tebe* ‘I am ready to help you’ vs. **On gotovit men'a pomoč' tebe*, expected meaning ‘He is making me ready to help you’; *Ja vinovat pered Vami* ‘I am guilty towards you’ vs. **On obvinil men'a pered Vami*, lit. ‘He accused me towards you’

RESULTS: AN OVERVIEW




VERBAL ROLES → ADJECTIVAL ROLES

- The roles of adjectival arguments can be adequately tagged using the inventory of roles describing verbal arguments.
- 6 of the 16 experimental blocks with an example evaluated from 5 to 7 on average, 7 blocks with an average mark from 4 to 5.

*Natal'ja Jur'jevna byla očēn' blizka s **otcom*** 'Natalya Jurievna was very close to her father' – *Kol'a družīt s **Natašej*** 'Kolya is friends with Natasha' (COUNTER-AGENT OF SOCIAL RELATION; 6.4).

*Pet'a sil'en v **matematike*** 'Petya is good (lit.: strong) at mathematics' – *On vseh obošel v **učebe*** 'He left everyone behind in his studies' (SPHERE; 6).

*Samymi ščedrymi na **novogodnie podarki** v etom godu stanut rukovoditeli rossijskih kompanij i gosslužaščie* 'This year the most generous in giving New Year's presents will be the managers of Russian companies and civil servants' – *Deduška dal rebenku **konfetu*** 'Grandfather gave a sweet to a child' (PATIENT; 4.8). 

PREDICATIVE VS. ATTRIBUTIVE USES

- An issue for further discussion.
- Many predicative uses with high scores, but:
 - ✓ Some attributive uses are also there.
 - ✓ There are plenty of predicative uses with low scores, and the factors causing difference between the examples anyway have to be accounted for.



ROLE INVENTORY FOR ADJECTIVES

- A draft, not all the possible adjectival constructions and semantic classes in the survey.
- 14 roles (overall rating 4 or higher).
- Verbal roles can be in principle transferred to adjectival constructions.
- The inventory can be enlarged using the principles highlighted by the experiment.

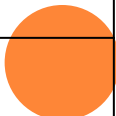


A SUBSET OF THE ROLE INVENTORY FOR ADJECTIVES

Semantic role	Adjective and morpho-syntactic pattern
Counter-Agent of social relation	<i>blizkij s + Sins</i> 'close to smb (e.g., a friend)', <i>vinovatyj pered + Sins</i> 'guilty towards smb'
Patient	<i>svobodnyj ot + Sgen</i> 'free from sth', <i>schedryj na + Sacc</i> 'generous in sth (e.g., gifts)'
Content of thought	<i>gotovyj Vinf</i> 'ready to do sth.'
Content of action	<i>gotovyj Vinf</i> 'ready to do sth.' (a competing role in the results of the survey)
Content of utterance	<i>schedryj na + Sacc</i> 'lavish with sth (speech etc.)'
Addressee	<i>vinovatyj pered + Sins</i> 'guilty towards smb' (a competing role in the results of the survey)
Beneficiary	<i>svobodnyj dl'a + Sgen</i> 'free for smb/sth'

A SUBSET OF THE ROLE INVENTORY FOR ADJECTIVES

Location	<i>blizkij k + Sdat / ot + Sdat</i> 'close to sth.'
Point of destination	<i>blizkij k + Sdat</i> 'close to sth.' (a competing role in the results of the survey)
Sphere	<i>sil'nyj v + Sloc</i> 'strong in sth.'
Social environment	<i>izvestnyj v + Sloc</i> 'famous among smb'
Goal	<i>svobodnyj dl'a + Sgen</i> 'free for smb/sth' (a competing role in the results of the survey)
Feature	<i>sil'nyj Sins</i> 'strong with sth.'
Property of Reason for mental state	<i>izvestnyj Sins</i> 'famous with sth.'



SEMANTICS VS. MORPHO-SYNTAX

- Higher scores for closer semantic classes with the same morpho-syntactic marking.

Pet'a sil'en v matematike 'Petya is good (lit.: strong) at mathematics' – *On vseh obošel v učebe* 'He left everyone behind in his studies' (SPHERE; 6) vs. *Ja živu v Moskve* 'I live in Moscow' (PLACE; 2.4).

Etot žurnalist izvesten svoimi razoblačitel'nymi publikacijami 'This journalist is famous for his unmasking publications' – *Pavel porazil vseh **dlinnymi volosami*** 'Pavel amazed everyone with his long hair' (PROPERTY OF THE REASON FOR EMOTIONAL STATE; 5.2) vs. *Ivan razbil okno **palkoj*** 'Ivan broke the window with a stick' (INSTRUMENT; 3.2).




SEMANTICS VS. MORPHO-SYNTAX

- For several semantically adequate candidates: similarity in the morpho-syntactic pattern.

*Avar'ijnye vyhody i prohody dolžny byt' svobodny **ot ručnoj kladi*** 'Emergency exits and passages must be free of hand luggage' – *My očistili čerdak **ot hlama*** 'We cleared the attic of junk' (PATIENT; 6) vs. *My ubrali **al'bomy** s polok* 'We removed the albums from the shelves' (PATIENT; 3.1)

*Policija zaderžala narkotorgovca, izvestnogo v **opredelennykh krugakh** pod kličkoj "Korotyška"* 'The police arrested a drug pushed known as "Shorty" in criminal circles' – *Soobščenie posejalo paniku v **r'adah vraga*** 'The message spread panic among the ranks of the enemy' (SOCIAL CIRCLE; 4.9) vs. ***Ivan** znaet, čem končilos' delo* 'Ivan knows how the things have finished' (SUBJECT OF MENTAL STATE; 3.2).



STATIVE VS. DYNAMIC SEMANTICS: *BLIZKIJ* 'CLOSE'

- Point of destination - like argument:

Ekspedicija obsledovala blizkie k Saransku sela 'The expedition explored the villages close to the city of Saransk'

- Initial point - like argument:

V tu že subbotu, rannim večerom, uspel Aleksandrov sbegat' s kon'kami na nebol'šoj, no ujutnyj i blizkij ot doma katok Patriarših prudov 'On the same Saturday, early in the evening, Aleksandrov had time to run with his skates to the small but cosy skating-rink of Patriarshie ponds, which was close to (lit.: from) his home'

- Verbal candidates for assessment:

- ✓ Point of destination (*podojti k domu* 'approach the house')
- ✓ Initial point (*otojti ot dveri* 'move away from the door')
- ✓ Location (*hodit' u reki* 'go along the river').



STATIVE VS. DYNAMIC SEMANTICS: *BLIZKIJ* 'CLOSE'

	Point of dest.	Init. point	Loc.
<i>blizkij</i> + <i>k</i> (Point of dest. - like)	4.3	2.6	4.7
<i>blizkij</i> + <i>ot</i> (Init. point - like)	3.6	3.3	4.1

- Stative nature of adjectives => disposition to a stative role of Location.
- Morpho-syntactic factor in the choice between two dynamic roles.



BENEFITS FOR VERBAL ROLES

- Hierarchy of verbal roles in FrameBank.
- Mainly on semantic grounds.
- Certain verification in this experiment.
- High average scores for two verbal examples => the roles are semantically similar.
- Significantly different scores for two verbal examples => the roles are semantically different.
- Low scores for two verbal examples => no conclusion.



BENEFITS FOR VERBAL ROLES



BENEFITS FOR VERBAL ROLES

*Natal'ja Jur'jevna byla očen' blizka s **otcom*** 'Natalya Jurievna was very close to her father'

- 1). ***On** vospityvaet *trjoh synovej** 'He brings up three sons' (SUBJECT OF SOCIAL RELATION; 2)
 - 2). *Kol'a družít s **Natašej*** 'Kolya is friends with Natasha' (COUNTER-AGENT OF SOCIAL RELATION; 6.4)
 - 3). *Mit'a podrals'a s **Lešej*** 'Mitya fought with Lyosha' (COUNTER-AGENT; 3.4)
 - 4). ***Krest'janin** rubít drova* 'The peasant is chopping firewood' (AGENT; 1.2)
- Counter-Agent of social relation can possibly be a subtype of Counter-Agent, which supports the hierarchy in FrameBank.
 - However, Counter-Agents differ much from Agents, contrary to the hierarchy.

CONCLUSIONS

- Adjectives and verbs can in principle share the same role inventory, the inventory of adjectival roles is at least a subset of the inventory of verbal roles.
- Some principles which could govern assigning semantic roles to adjectives.
- Semantic similarity + morpho-syntactic similarity for semantically adequate candidates + stative semantics.
- Much work to do in elaborating the role inventory for adjectives and in studying their valency patterns in comparison to verbs.

