The Bulgarian Event Corpus (BEC): Overview and Initial NER Experiments

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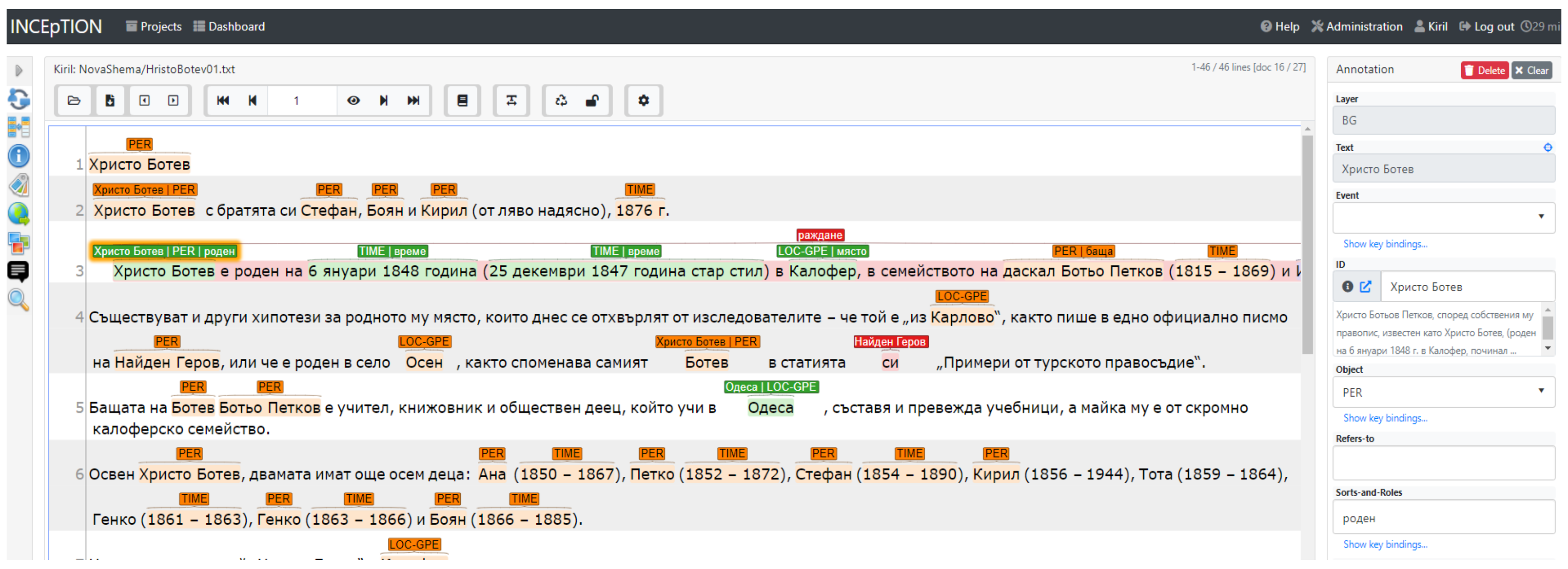
1. Overview

- The main reason for the construction of the BEC corpus is to have appropriate data for training Named Entity Recognition (NER), Named Entity Linking (NEL) and Event Recognition models
- Such models would help us in the extraction of structured knowledge from domain texts in the area of Social Sciences and Humanities (SSH)
- The extracted structured knowledge will be ultimately used for the creation of a Bulgaria-centric Knowledge Graph
- The corpus comprises a wide variety of domain texts:
  - historical texts from different periods of Bulgarian history;
  - cultural artefacts like church icons;
  - scientific publications;
  - archival documents;
  - encyclopedic articles from Bulgarian Wikipedia.
- In the initial annotation of the corpus we concentrated on:
  - a rich set of Named Entities,
  - some general concepts and events that happen to be frequent

2. BEC Specifics and Annotation Schema

- In order to control and predict the structure of the extracted knowledge, the annotation scheme followed the philosophy of CIDOC-CRM - ontology which has been widely used in the area of GLAM (Galleries, Libraries, Archives, and Museums) and Humanities
- In addition, we used event descriptions from FrameNet, and locally adjusted the scheme to our data
- For the creation of the corpus we relied on the INCEpTION annotation tool (https://inception-project.github.io/)



Kiril: NovaShema/HristoBotev01.txt

1-46 / 46 lines [doc 16 / 27]

1 Христо Ботев [PER]

2 Христо Ботев с братята си Стефан, Боян и Кирил (от ляво надясно), 1876 г. [Христо Ботев | PER] [PER] [PER] [PER] [TIME]

3 Христо Ботев е роден на 6 януари 1848 година (25 декември 1847 година стар стил) в Калофер, в семейството на даскал Ботьо Петков (1815 – 1869) и [Христо Ботев | PER | роден] [TIME | време] [TIME | време] [раждане] [LOC-GPE | място] [PER | баща] [TIME]

4 Съществуват и други хипотези за родното му място, които днес се отхвърлят от изследователите – че той е „из Карлово", както пише в едно официално писмо на Найден Геров, или че е роден в село Осен , както споменава самият Ботев в статията си „Примери от турското правосъдие". [LOC-GPE] [PER] [LOC-GPE] [Христо Ботев | PER] [Найден Геров]

5 Бащата на Ботев Ботьо Петков е учител, книжовник и обществен деец, който учи в Одеса , съставя и превежда учебници, а майка му е от скромно калоферско семейство. [PER] [PER] [Одеса | LOC-GPE]

6 Освен Христо Ботев, двамата имат още осем деца: Ана (1850 – 1867), Петко (1852 – 1872), Стефан (1854 – 1890), Кирил (1856 – 1944), Тота (1859 – 1864), Генко (1861 – 1863), Генко (1863 – 1866) и Боян (1866 – 1885). [PER] [PER] [TIME] [PER] [TIME] [PER] [TIME] [PER] [TIME] [TIME] [PER] [TIME] [PER] [TIME]

[LOC-GPE]

Annotation — Delete — Clear

Layer: BG

Text: Христо Ботев

Event:

Show key bindings...

ID: Христо Ботев

Христо Ботьов Петков, според собствения му правопис, известен като Христо Ботев, (роден на 6 януари 1848 г. в Калофер, починал ...

Object: PER

Show key bindings...

Refers-to:

Sorts-and-Roles: роден

Show key bindings...

- Several Annotation Levels: Named Entity Annotation - PER, LOC, LOC-GPE, ORG, TIME; Events and Roles – Event definition and participants roles: Event(Role01, Role02, …). Kappa: between 0.87 and 1.0
- Events are selected on the basis of ontology CIDOC-CRM and extended with frames from FrameNet: between 0.87 and 0.91
- Named Entities are annotated with identifiers from Bulgarian DBPedia

3. Named Entities Types

Label	Description
DOC	Various texts, including documents, excluding juridical documents – see **JUR**
EVT	Named events like Second World Wars
JUR	Juridical documents: laws, regulations, etc.
LOC	Locations/places — natural or man-made like mountains, lakes, etc., geopolitical units are excluded – see **LOC-GPE**
LOC-GPE	Geopolitical units (countries, regions, cities, cantons, etc.)
MSC	Miscellaneous names that not included in the other categories
MSR	Measurements with expressed quantity
ORG	Organizations of any kind
PER	People (existing in reality or fictional ones)
PER-GPE	Nationalities (Bulgarian), the birth place, or the place where people live
PER-GRP	Groups of people that cannot be described as **PER-GPE** or **PER-LOC** (Slavs, etc.)
PER-LOC	People that are related to geographical region, but not **PER-GPE**
PRO	Products — tangible and intangible (**DOC** and **JUR** excluded)
REF	Bibliographical references, citations of them, links.
SUM	Amounts of money — a subclass of **MSR**
TIME	Time points or periods

4. Event Types

Event	Roles
Donation	**donor** (person or organization) **recipient** (person or organization) **theme** (object) **mediator** (person or organization, it could be fund) **period–of–iterations** (time: the length of time from when the event denoted by the target began to be repeated to when it stopped) **goal** (situation: the goal for which the donor gives the theme to the recipient) **time** **place**
Giving–Birth	**brought–into–life** (the new born person) **parents** (the mother and father expressed together, for example "his parents" or "Penka and Toncho Ivanovi") **mother** **father** **place** (the birth place — usually the name of a city, country or hospital) **time** (the time of birth — usually it's a date, but can include hours, or it's just month and year)
Moving–in–Place	**agent** (a person) or theme (another type of object) **coagent** (another person or group of people the agent is moving with) **move-from** (the place from which the agent or the time moves) **move-to** (the place where the agent or the theme moves to) **time/beginning/end/duration** **purpose** (a situation or another event which causes the moving) **goal** (a situation/event to be achieved with the moving)

5. From Annotation to RDF

Mapping between AS to CIDOC-CRM defines the conversion to RDF:

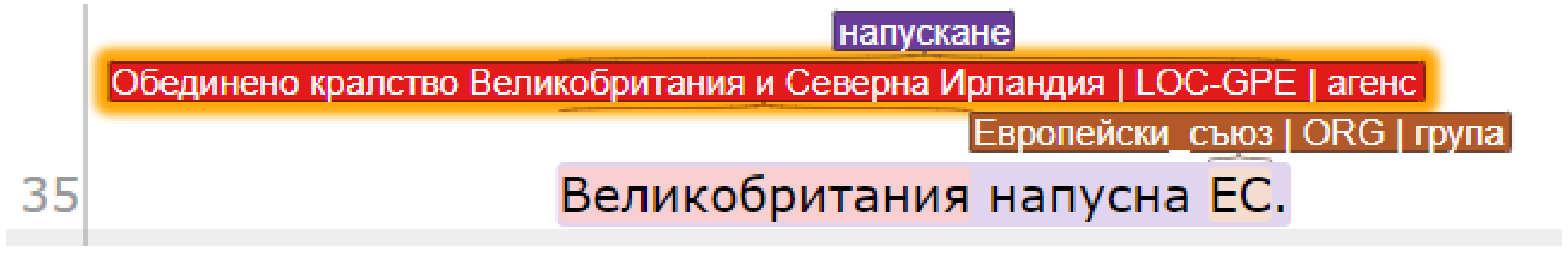
E86 Leaving = leaving

E39 Actor (**E21 Person** = ***PER*** **E74 Group** = ***ORG*/*LOC-GPE***)

P145 separated (left by) = ***agent*** domain: **E86 Leaving** range: **E39 Actor**

#Text=Великобритания напусна ЕС. ***Great Britain left EU.***

35-1 2091-2105 Великобритания ***LOC-GPE***[118]
http://bg.dbpedia.org/resource/Обединено_кралство[118]
agent[118] ***leaving***[118]



напускане

Обединено кралство Великобритания и Северна Ирландия | LOC-GPE | агенс

Европейски_съюз | ORG | група

35 Великобритания напусна ЕС.

http://bg.dbpedia.org/resource/Обединено_кралство rdf:type
http://www.cidoc-crm.org/cidoc-crm/E74_Group .
dbpedia:Обединено_кралство a cidoc:E74_Group .
dbpedia:Европейски_съюз a cidoc:E74_Group .
dbpedia:Излизане_на_ВБ_от_ЕС a cidoc: E86_Leaving .
dbpedia:Излизане_на_ВБ_от_ЕС cidoc: P145_separated
dbpedia:Обединено_кралство .
dbpedia:Излизане_на_ВБ_от_ЕС cidoc: P146_separated_from dbpedia: ЕС .

6. Experiments and Results

The models that were initially trained are implementations in spaCy, Flair NLP and Hugging Face

		NER-TBP			BiLSTM		
Entity	**Examples**	**P**	**R**	**F1**	**P**	**R**	**F1**
TIME	495	80.87	71.51	**75.90**	70.00	81.01	74.81
LOC	197	68.53	58.95	63.38	71.60	61.42	**66.12**
LOC-GPE	641	80.99	84.43	82.67	84.32	91.42	**87.72**
PER	858	79.61	83.05	81.29	85.26	84.97	**85.11**
ORG	300	64.47	67.77	66.08	67.55	68.00	**67.77**
JUR	17	34.09	36.59	35.29	53.85	41.18	**46.67**
EVT	126	68.60	50.43	58.13	76.79	68.25	**72.27**
PERS	134	82.46	59.49	69.12	85.34	73.88	**79.20**
DOC	35	29.79	24.56	**26.92**	23.08	25.71	24.32
PRO	112	24.24	12.50	16.49	36.51	20.54	**26.29**
SUM	195	50.00	10.34	17.14	65.78	63.08	**64.40**
All	3114	74.85	71.38	73.08	76.29	76.69	**76.49**