Text Summarization – Exploring Potential of PSO Usage in Extractive Algorithms

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Agenda

- Extractive text summarization
- Our model based on PSO
- Results
- Deployment

Extractive text summarization

A task where the contents of a longer body of text, usually spanning multiple sentences, are condensed in a short summary by extracting the key phrases from the original text.

Our extractive algorithm chooses a subset of original sentences.

PSO (Particle Swarm Optimization)

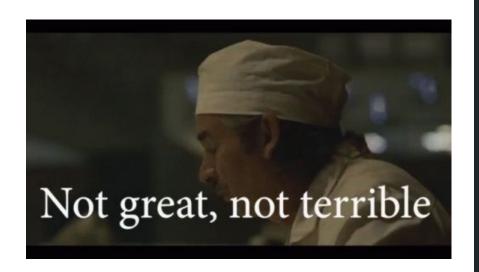Using swarm intelligence to quickly find global extreme.

Idea

1. Split article into sentences.
2. Transform each sentence to its numerical embedding.
3. Compute distances between all pairs of sentences and sentence similarities to the whole article.
4. Use these values to score sentence subsets for PSO algorithm.

Details of PSO implementation

Clerc's constricted PSO (no need for position and velocity boundaries)

- particles' positions are binary vectors indicating subset of sentences

- score is defined by mean distance between chosen sentences' embeddings and the rest

- model is penalized for exceeding maximum number of sentences

Benchmarks

Not great, not terrible

Metric	PSO score	MatchSum score
ROUGE-1	0.342	0.440
ROUGE-2	0.130	0.205
ROUGE-L	0.279	0.401

transformer capacity	MiniLM-L6-v2 0.1	MiniLM-L12-v2 0.5	distiloberta-v1 0.5	mpnet-base-v2 0.5
ROUGE-1	**0.342**	0.321	0.313	0.316
ROUGE-2	**0.130**	**0.130**	0.119	0.123
ROUGE-L	**0.279**	0.265	0.253	0.256

Experiment summarization

1. PSO works as a text summarizer yet is outperformed by modern NLP methods.

2. Its advantage, compared with NN, is no need for training, however summarization itself is less time efficient.

3. A lot depends on a target function, where all comes down to a bit of luck and small language nuances.

Deployment

Making our model available for other people

- Python web application for article summarization
- Created using FastAPI
- Containerized using Docker with Docker Compose

Our application

Arsenal's midfield trio Jack Wilshere, Mikel Arteta and Abou Diaby have all been handed starts for the club's Under 21s game on Tuesday night as they continue their respective recoveries from injury. Steve Gatting's young Gunners take on Stoke City at the Emirates Stadium in a U21 Premier League clash. Teenage winger Serge Gnabry is also in the starting line-up, alongside a host of promising youngsters including Dan Crowley. Jack Wilshere, pictured in first team training last week, starts for Arsenal Under 21s on Tuesday night . Club captain Mikel Arteta (left) is also in the team to play against Stoke City at the Emirates Stadium . Wilshere watched Arsenal beat Liverpool 4-1 in the Premier League from the stands on Saturday afternoon . Iliev, Maitland-Niles, O'Connor, Bielik, Ormonde-Ottewill, Diaby, Arteta, Gnabry, Wilshere, Crowley, Iwobi . Wilshere has been out of action since November after breaking his foot against Manchester United, as has club captain Arteta who picked up an ankle injury at home to Borussia Dortmund. Diaby's fitness troubles have been well documented, with the French midfielder racking up 227 weeks out during his nine-year career with the club. All three featured in last week's practice match against a Brentford development XI, with England international Wilshere scoring in the 4-0 victory. Mathieu Debuchy and Mathieu Flamini also appeared in that game, though both are now closer to first team action with the latter coming on against Liverpool on Saturday. Arsene Wenger said last Thursday: 'They've no problem after that coming out of the game. They are back available in training, a bit short still of top competitive level certainly but that's normal. 'They've been out for a long time but I was quite surprised by how fit they looked and the quality of their performance - it was good.' Gnabry, who played nine times in the Premier League last season, has been blighted by injuries this term, and is yet to play a first team game. Abou Diaby has been blighted by injuries for the best part of a decade but played last

Summarize

Arsenal's midfield trio Jack Wilshere, Mikel Arteta and Abou Diaby have all been handed starts for the club's Under 21s game on Tuesday night as they continue their respective recoveries from injury. Jack Wilshere, pictured in first team training last week, starts for Arsenal Under 21s on Tuesday night . Club captain Mikel Arteta (left) is also in the team to play against Stoke City at the Emirates Stadium

Thank you for your attention