# An organizational approach for discipline prediction in research projects

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# Outline



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# Introduction

RIS systems store research information: publications, projects

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Classifying research documents is an essential task

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Classifying research documents is an essential task

Automatically classifying disciplines is challenging

Current approaches: citation-based, machine learning algorithms

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# Introduction

Project metadata

- title
- keywords
- abstract
- researchers
- organisations
- disciplines

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Machine learning approach for discipline prediction


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# Proposed approach

Predict disciplines of project based on disciplines of researchers

Researcher disciplines

- profile
- organizations
- projects
- co-authors on projects
- publications
- co-authors on publications

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# Proposed approach

Each researcher is represented by a matrix (N x 6)

| | profile | organization | projects | co-authors on projects | publications | co-authors on publications |
|---|---|---|---|---|---|---|
| **discipline 1** | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.2 |
| **discipline 2** | 0.2 | 0.3 | 0 | 0 | 0.2 | 0.1 |
| **discipline 3** | 0.3 | 0.4 | 0.2 | 0.3 | 0 | 0 |
| **...** | ... | ... | ... | ... | ... | ... |
| **...** | ... | ... | ... | ... | ... | ... |
| **discipline N** | ... | ... | ... | ... | ... | ... |

where a cell (i,j) is frequency of discipline i in resource j

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A project is represented by a matrix (N x 6), i.e., sum of researchers matrices

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A project is represented by a matrix (N x 6), i.e., sum of researchers matrices

Project data for training models is a 3-dimension matrix (M x N x 6)

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# Proposed approach

Deep learning models

- Recurrent neural networks

  Long Short-Term Memory Networks (LSTM)

  Bidirectional Long Short-Term Memory Networks (BiLSTM)

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# Proposed approach

Deep learning models

- Recurrent neural networks

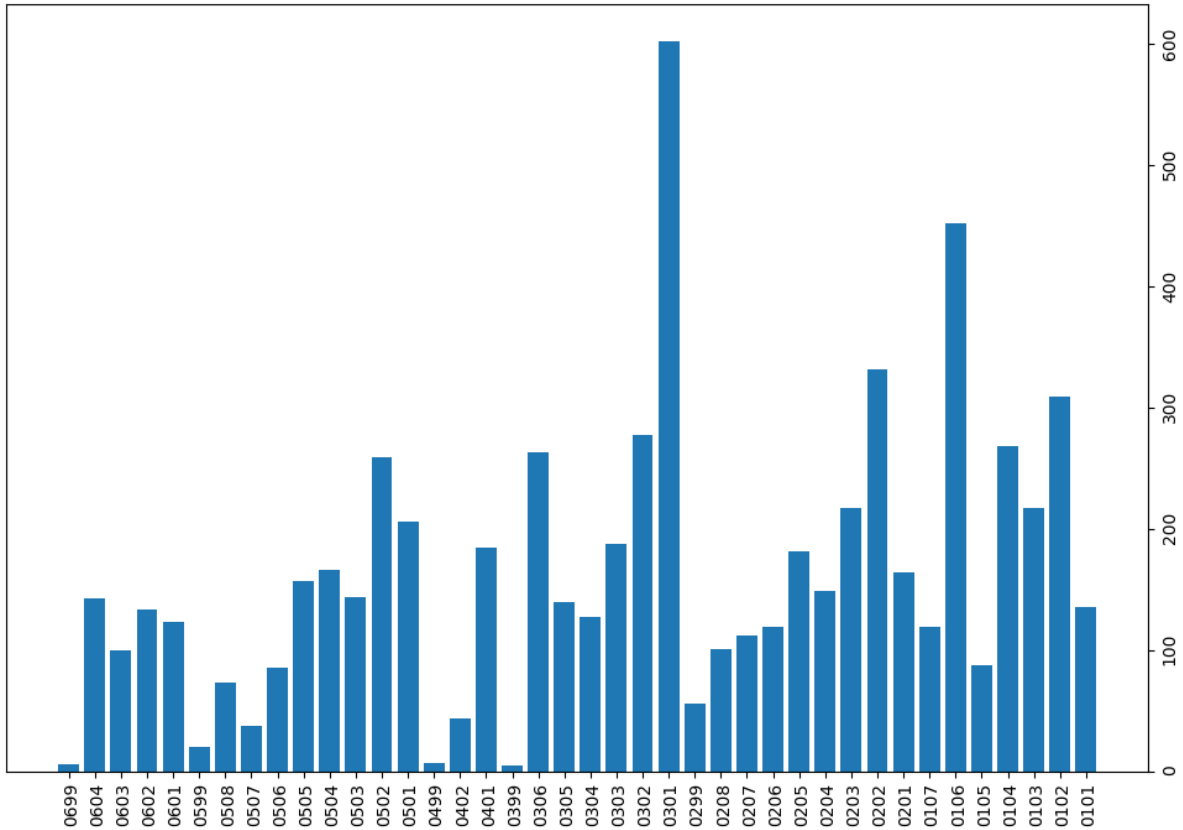
  Long Short-Term Memory Networks (LSTM)

  Bidirectional Long Short-Term Memory Networks (BiLSTM)

- Convolutional Neural Networks (CNN)

# Experimental setup

Dataset: 3954 projects, 42 disciplines
Feature matrix: (3954, 42, 6)
Training and testing: 80%, 20%

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# Experimental setup

- Model hyperparameters
  - numbers of hidden units = 128
  - epochs = 100
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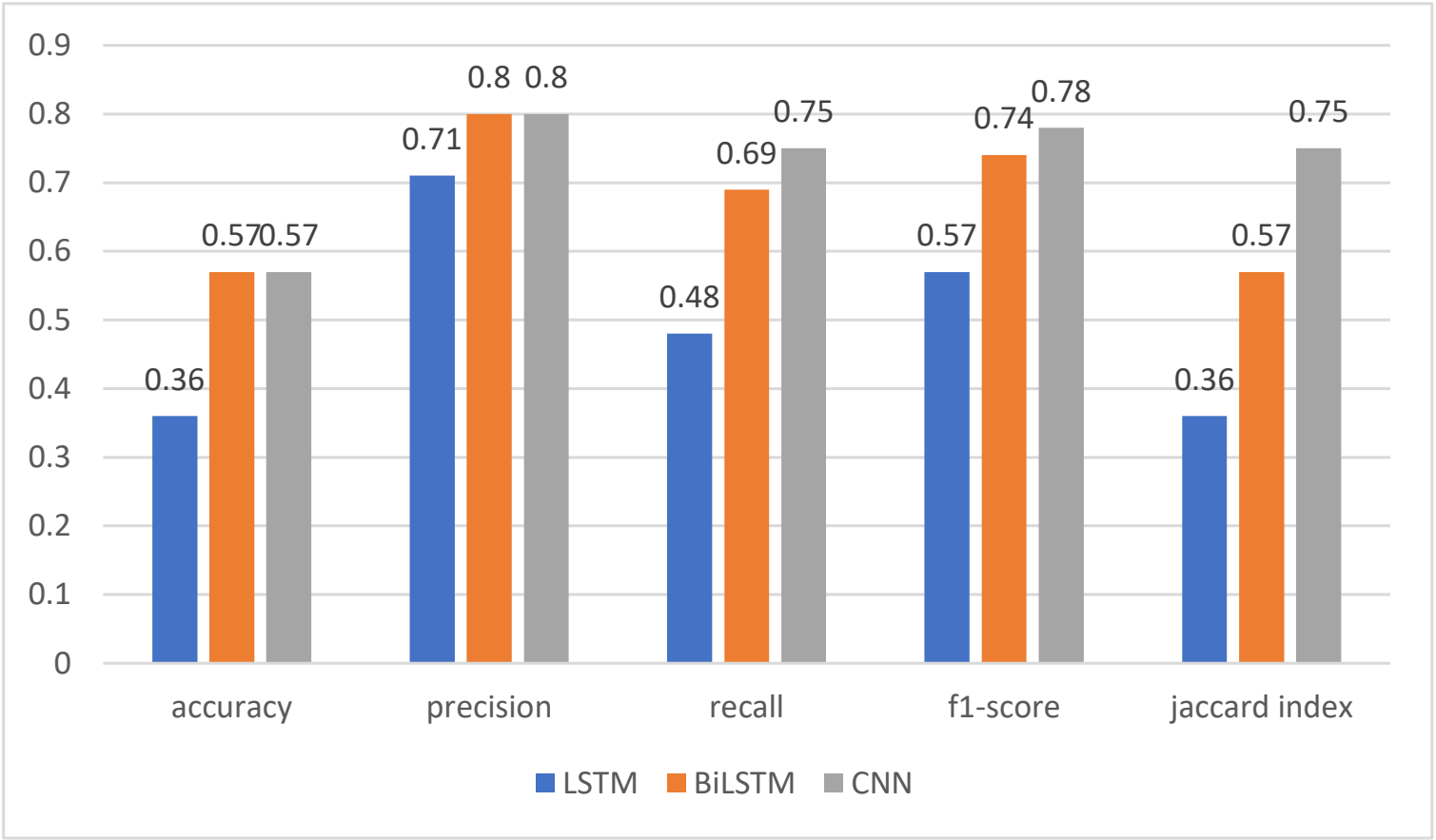
- Model hyperparameters
  - numbers of hidden units = 128
  - epochs = 100
  - optimizer='adam'
- Metrics
  - accuracy
  - precision
  - recall
  - f1-score
  - jaccard index

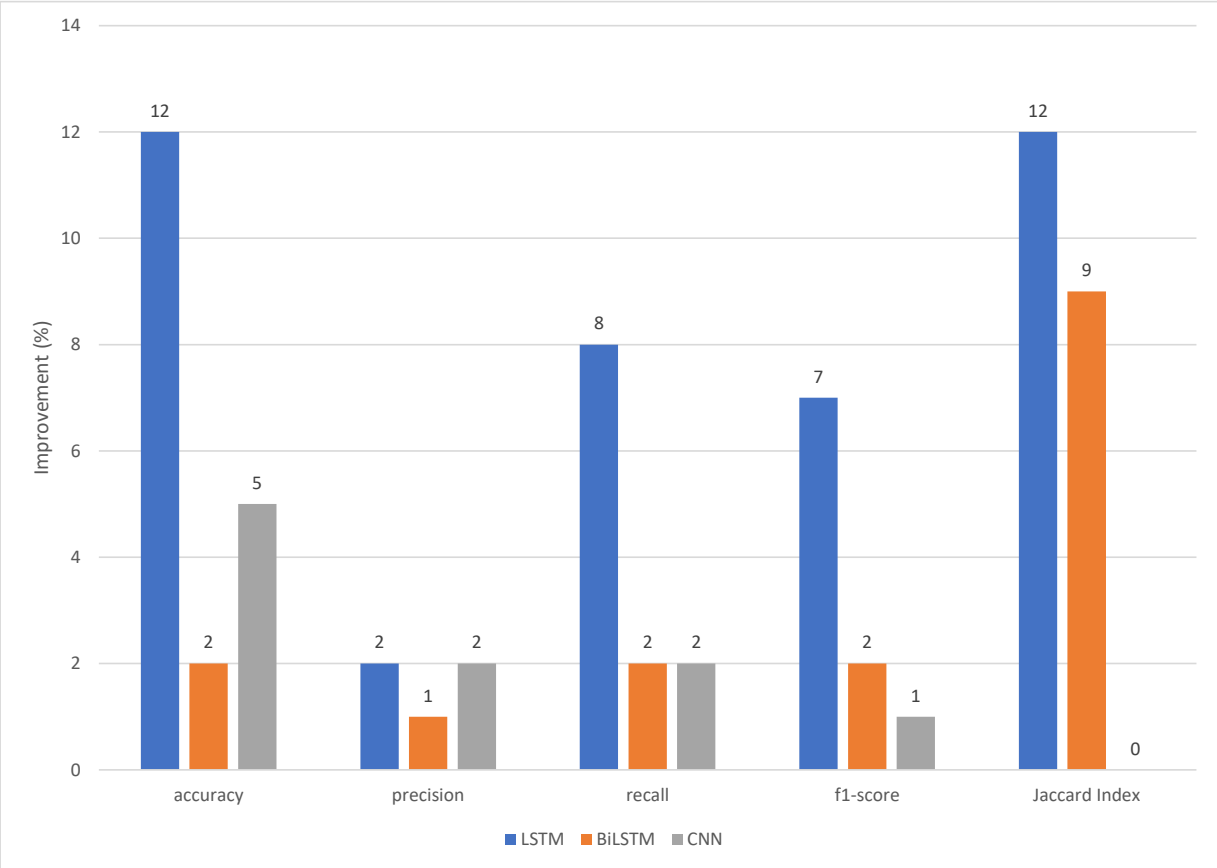
# Performance results

## Performance of models



# Performance results

Performance of the models on the dataset, after excluding projects containing low-frequency disciplines



# Conclusion

We proposed a new approach to predict disciplines related to a project, based on the disciplines of researchers

Performance of deep learning models was relatively high

Further data pre-processing could improve the models' performance

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# Conclusion

We proposed a new approach to predict disciplines related to a project, based on the disciplines of researchers

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Further data pre-processing could improve the models' performance

Future work

- Further evaluate models on larger datasets
- Experiment with different hyperparameters
- Consider preprocessing the data differently, such as using different normalization techniques or feature engineering.

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# Thank you for listening