Chess Q&A: Question Answering on Chess Games

Reasoning, Attention, Memory
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Visual Question Answering

Which city is pictured?

Malinowski et. al. 2015, Gao et. al. 2015, Ren et. al. 2015, Antol et. al. 2015
Visual Question Answering

Which city is pictured?

Malinowski et. al. 2015, Gao et. al. 2015, Ren et. al. 2015, Antol et. al. 2015
Abstract Scenes

Does the man have a good heart?

Antol et. al. 2015
is this a stalemate?
Learning Setup

- sequence of moves
  - d4 d5 c4 e5 cxd5 Qxd5 ...

- board configuration
  - Image
  - FEN: 8/5p2/4bP1k/4P2n/7K/8/8/8

- question
  - “is this a stalemate?”
Question Types

- Position
  - What piece is on a2?
- Counting:
  - how many pieces on board?
  - how many pieces does white have?
  - is there any queen on the board?
  - What is the material advantage of black?
- Attacking and Moves
  - Which piece is attacking white bishop at a6?
  - Is b2g7 a legal move?
  - Is white in check?
- More Rules
  - Does black has castling rights?
  - Is this a checkmate?
Preparation of Dataset

- Games are from FICS Games Database
- Questions are generated using Python Chess Library
- Board is visualized using an open-source implementation
- 15 types of questions and 1K questions for each
Baseline Models

- **Baseline LSTM**: LSTM encoder on moves and question + board configuration and MLP on top of them

- **Deaf**: baseline without LSTM encoder on moves

- **Blind**: baseline without board configuration

- **Bag-of-words (BOW)-m**: bow features on moves instead of LSTM encoder

- **Bag-of-words (BOW)-q**: bow features on question instead of LSTM encoder

- **Attention**: Attention layer on moves and question

[Ren et. al. 2015]
Results

<table>
<thead>
<tr>
<th>Question</th>
<th>BOW-moves</th>
<th>BOW-question</th>
<th>Deaf</th>
<th>Blind</th>
<th>Baseline - LSTM</th>
<th>Baseline - Attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>is it checkmate</td>
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<tr>
<td>is it stalemate</td>
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<tr>
<td>does x have castling rights</td>
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<td>can x castle</td>
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<td>who has material advantage</td>
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<td>what is material count of x</td>
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<td>is x in check</td>
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<td>does x attack square y</td>
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<td>what is on square x</td>
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<td>how many pieces does x have</td>
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<td>how many pieces are on the board</td>
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<td>does x have piece y</td>
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<td>is there any piece x on the board</td>
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<td>is x--y a legal move</td>
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<td>what piece is attacking piece x</td>
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<td>All</td>
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</tbody>
</table>
Results

- is it checkmate
- is it stalemate
- does x have castling rights
- can x castle
- who has material advantage
- what is material count of x
- is x in check
- does x attack square y
- what is on square x
- how many pieces does x have
- how many pieces are on the board
- does x have piece y
- is there any piece x on the board
- is x→y a legal move
- what piece is attacking piece x

Legend:
- BOW-moves
- BOW-question
- Deaf
- Blind
- Baseline - LSTM
- Baseline - Attention

All
Conclusion

- Synthetic Q&A dataset 15K questions with 15 types
  http://goo.gl/wXeb0V

- Open-source : both data and the script

- Future Work
  - Analysis of models with visualizations
  - Curriculum Setup
  - Learn a KB of chess or learn from a KB?
Son

?