

Team 4

Remi Flicoteaux – Lead
Pierre Zweigenbaum
Vassilina Nikoulina
Yohan Taille
Sameh Megrhi
Claire Vinet
Cyril Grouin
Namik Taright
Thomas Séjourné
Michael Elbaz

Dat-ICU 2018

**Automated text classification
for ICD 9 diagnosis code
assignment from MIMIC
Database**

Hopital Rothschild - Campus Picpus

ICD coding

Internationally agreed standard from WHO

High value information for hospitals

- For billing
- For epidemiological studies
- For clinical trials
- For hospital activity measures
- For anti-biological stewardship

Challenges

Time consuming activity

Coding not performed directly by physicians

Not easily reproducible between similar patients

High inaccuracy rate of records requiring rework

Automated coding of medical acts and diagnosis would be a high improvement to provide better care and follow-ups to patients, enhance knowledge of hospitals of their own activity and support researchers with common definitions of comparable events between facilities

Aim of study

MIMIC contains both textual notes from discharge records completed by treating physicians and human-assigned ICD codes

Can this provide relevant data to train a system that provides automated ICD coding?

Cohort Selection

All visits with an hospital record

All visits with progress notes (to do)

Select ICD codes with at least 1,000 occurrences
(from 59,652 to 51,300 discharge summaries)

Method

Data selection:

- SparkSQL
- Pandas

Feature extraction:

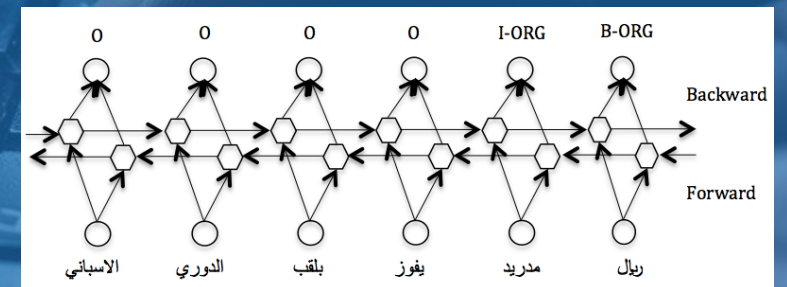
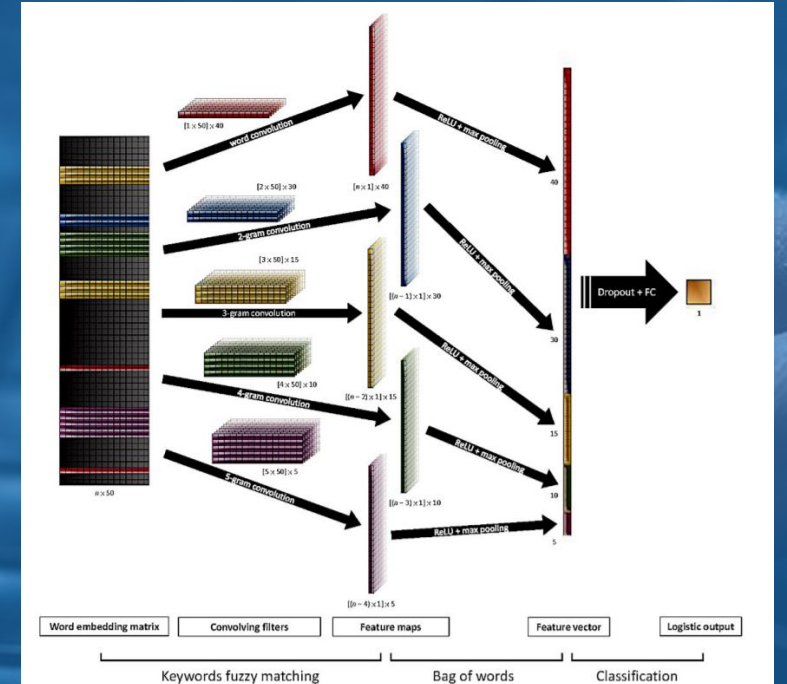
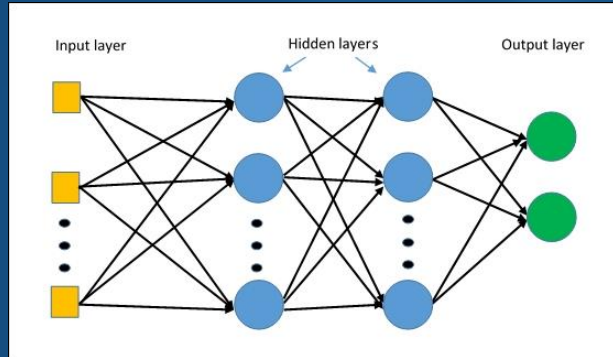
- bag of tokenized words: known ICD terms
- GloVe word embeddings trained on MIMIC texts

Classification:

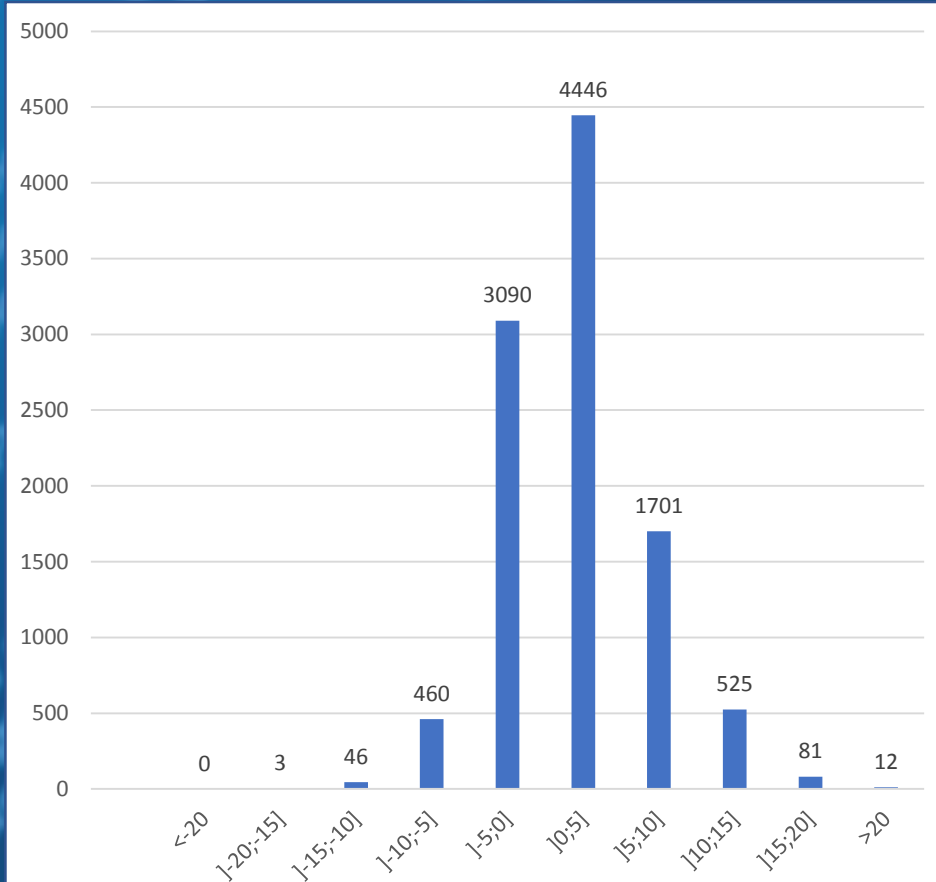
- Convolutional Neural Network
- Bidirectional LSTM
- Multilayer perceptron

Evaluation:

- F-Score



Bidirectional LSTM evaluation

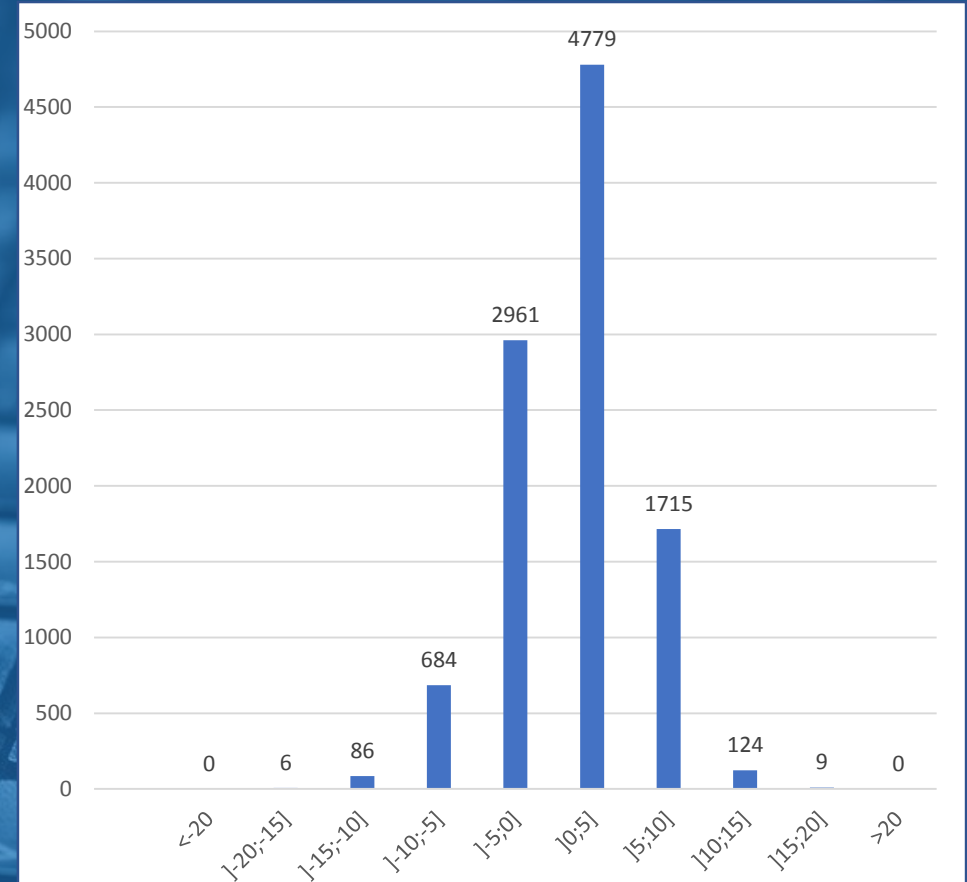


Threshold
0,25

On
10,354
expected

Max
F-Score
with a 0,3
thershold

Convolutional Neural Network Evaluation



**Further developments
&
Discussion**

**Interaction with other
teams**
(active learning procedure for
production...)

**Further improvements
& testing**

**Web service
deployment**



Flask

web development,
one drop at a time

http://127.0.0.1:5000/icu

Params

Send

Save

aders

Body

Pre-request Script

Tests

Cookies Code

www-form-urlencoded raw binary Text

Date: [**2138-6-9**] Discharge Date: [**2138-6-12**]\n\nDate of Birth: [**2111-2-28**] Sex:
ervice: Cardiothoracic Surgery\n\nPREOPERATIVE DIAGNOSIS:\n1. Bicuspid aortic valve.\n2. Dilated aorta.\n3.
Aortic insufficiency.\n\nHISTORY OF PRESENT ILLNESS: The patient has had a heart\nmurmur since childhood and found to
have a bicuspid aortic\nvalve on echocardiogram, and recently had an increase in the\nsize of the ascending aorta.
Otherwise, the patient denies\nany other medical problems. [**Name (NI) **] did have surgery in [**2124**] for\nan
undescended testicle.\n\nSOCIAL HISTORY: Denies a smoking history. Occasional\nalcohol, maybe once per week.\n\nFAMILY
HISTORY: Noncontributory.\n\nMEDICATIONS ON ADMISSION: Prophylactic antibiotics.\n\nALLERGIES: No known drug
allergies.\n\nLABORATORY ON ADMISSION: Preoperative vital signs were a\nheart rate of 78, blood pressure 102/68,
respiratory rate\nof 18. He was a healthy, 27-year-old male. Lungs were\nclear. Heart had a 3/6 systolic ejection
murmur. Otherwise\nthe examination was within normal limits.\n\nHISTORICAL COURSE: See on [**2138-6-9**] the

Body

Cookies

Headers (4)

Test Results

Status: 200 OK

Time: 4348 ms

Size: 2.82 KB

Pretty

Raw

Preview

HTML



Save Response

```
1 {"HADM_ID":{"0":"000"},"008":{"0":"0.0590254478"},"031":{"0":"0.1057657078"},"038":{"0":"0.1935391575"},"041":{"0":"0.1701635271"},
  "043":{"0":"0.0755844414"},"048":{"0":"0.1731723249"},"049":{"0":"0.1357786506"},"057":{"0":"0.044159025"},"070":{"0":"0.
  .0934861824"},"076":{"0":"0.0124489684"},"112":{"0":"0.052752845"},"162":{"0":"0.045799043"},"197":{"0":"0.0672039911"},"198"
  :{"0":"0.071580708"},"244":{"0":"0.133835271"},"250":{"0":"0.3010516465"},"263":{"0":"0.050171297"},"272":{"0":"0.2639911175"},
  "274":{"0":"0.0731169134"},"275":{"0":"0.0484229922"},"276":{"0":"0.3398755789"},"278":{"0":"0.069890894"},"280":{"0":"0.
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Thank You to our hosts

