Cross-Border Data Flows and Emerging Technologies

Submitted by: Google
Cross-border data flows and emerging technologies

APEC SOM2 Digital Trade Policy Dialogue
17 May 2021
artificial intelligence
science of making things smart

machine learning
techniques to learn from data
given [input], what is best [output]?

machine learning
techniques to learn from data
machine learning scales better than rule-based code
detection of email spam

Rules and contingencies

Spam the old way:
Write a computer program with explicit rules to follow

if email contains Vagrâ 
    then mark 'is spam';
if email contains ...
if email contains ...

Spam the new way:
Write a computer program to learn from examples

try to classify some emails;
change self to reduce errors;
repeat;

Learning from data
neural network models
neural nets learn from examples

“cat”

“dog”

“car”

“apple”

“flower”
labeled photos

OUTPUT
after a model is trained, you can test it
input          output

“stop sign”
functions a deep neural network can learn

<table>
<thead>
<tr>
<th>input</th>
<th>output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pixels:</td>
<td>“hussar monkey”</td>
</tr>
<tr>
<td>Audio:</td>
<td>“How cold is it outside?”</td>
</tr>
<tr>
<td>“Hello, how are you?”</td>
<td>“Bonjour, comment allez-vous?”</td>
</tr>
<tr>
<td>Pixels:</td>
<td>“A blue and yellow train travelling down the tracks”</td>
</tr>
</tbody>
</table>
AI is used across Google products

- **Assistant**: Query understanding, Conversation
- **Search**: Query understanding, Search ranking
- **YouTube**: Video recommendations, Better thumbnails
- **Translate**: Text and speech translations
- **Cloud**: Cloud ML APIs, TPU
- **Home**: Speech recognition, Conversation
- **Photos**: Photos / video search, Auto-smile montage
- **Clips**: Smart image capture
- **Gmail**: Smart Reply, Spam classification
- **Drive**: Quick Access
- **Android**: Keyboard input (also in iOS)
- **Cardboard**: Image stitching
- **Maps**: Street View images, Parsing Local Search
- **Ads**: Richer Text Ads, Video summarization
- **Play**: App clustering, Music recommendations
ML has improved Google translate...

Google Translate

Chinese ▾

 английский ▾

Chinese

请问，洗手间在哪里？

Qīngwèn, xǐshǒujìān zài nǎlǐ?

English

Where Will the restroom?

OLD MODEL

Excuse me, where is the toilet?

NEW MODEL
accurate translation as an enabling of cross-border trade

Source: Brynjolfsson, Hui & Liu (NBER 2018)
AI used to detect diabetic retinopathy

<table>
<thead>
<tr>
<th>input</th>
<th>output</th>
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</table>

Grade of Diabetic Retinopathy

<table>
<thead>
<tr>
<th>F-score</th>
<th>Algorithm</th>
<th>Ophthalmologist (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.95</td>
<td>0.91</td>
<td></td>
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Gulshan, Peng et al., JAMA 2016
machine learning requires four ingredients

- Enough of the right kind of data to serve as training examples
- Algorithms and tools to build the model
- Computing power to run the model
- People to design and operate
tech skills + data skills + business expertise
Open-source innovation depends on global data sets

Google Cloud AI
APIs, custom ML, TPUs

TensorFlow
open-source machine learning library
Cross-border data flows and open data sets have enabled new innovations to meet evolving needs during COVID-19...
from Covid - 19 forecasting...
...to vaccine monitoring...
...to new translate functions
Live captioning in Google Meet expanding to 4 new languages