*Ask Programs Aloud -*

Making (Programming) Concepts Naturally Accessible at a Distance

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November 16, 2017 @ eSTEeM induction event

A. I. overtaking humans

10^{170} > number of all atoms
in the universe
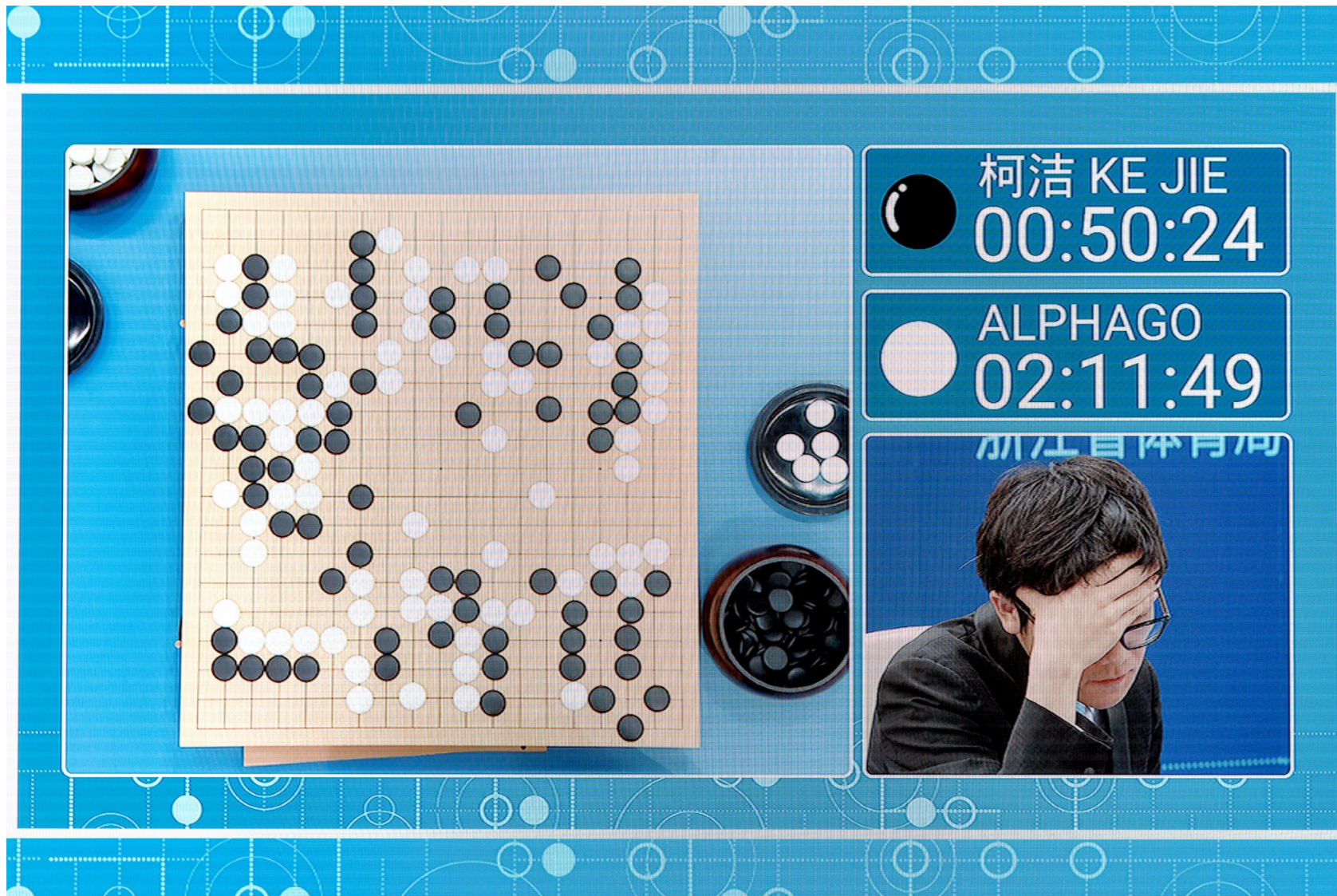
Geoffery Hinton once said:

In science, you can say things that seem crazy, but in the long run they can turn out to be right. We can get really good evidence, and in the end the community will come around.

"The Father of Deep Learning using Neural Networks"
My ex-colleague at University of Toronto

Image Classification

>98% accurate

MK Hackathon last weekend with Neil Smith

Courtesy to **Festive Roads** and **MKHackathon.org**

https://github.com/yijunyu/festive-road-tagging/tree/master/tensorflow

Vision for the Visually Disabled

- Teaching programming concepts to visually impaired learners:

  - Can programs be heard instead?

  - Can teaching become chatbot dialogues?

- A new pedagogy on programming

Embracing the future: in many ways, the future is already upon us !!!

Comprehension

- Software are invisible

  - *Users understand by observing their behaviours E.g., Powerpoint, Keynote are software*

- Their presentation, programs, are visual

  - *Programmers understand by reading their structures E.g., 10 million lines of code*

- A gap between software and programs:

  - *Are we teaching programming in a right way ?*

Hello, world !

```
1  public class Hello {
2          public static void main(String args[]) {
3                  System.out.print("Hello, world!");
4          }
5  }
```

- *Do you see it as a software ?*
  No, we are no machines !
  You have to "explain" the program in "natural" language.

# Hello, world !

```java
1  public class Hello {
2          public static void main(String args[]) {
3                  System.out.print("Hello, world!");
4          }
5  }
```

- *This is a software that displays a message "Hello, world!" on the screen.*

- *It is written in Java programming language, therefore, you need a Java compiler to convert into byte code that will be executed by a Java virtual machine.*

- *Any Java application like this one must implement a "main" method, encapsulated by a class, as the entrance of the main thread of control.*

- *…*

Better we have a dialogue

```
   ▜ic class Hello {
2      pu        ic void ma    ng args[]) {
3                          ("Hello, world!");
4       }
```

- What does the software do?

  - *It displays a message "Hello, world!" on screen.*

- How does it achieve this (function) ?

  - *In the "main" method, it calls a "System" library function to "print" the string "Hello, world!" to standard "output" channel, which is the console screen of the computer running this program.*
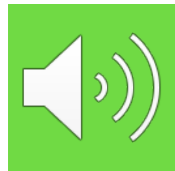
We are in an era of A.I.

- How many of you have heard of "Alexa" ?

Customers have also enabled

"Alexa, ask insult generator to generate an insult."
Insult Generator
★★★★☆ 31

"Alexa, ask best knock knock to tell me a joke"
Worlds Best Knock Knock Jokes
★★★☆☆ 12

Brain
★★★

We are in an era of A.I.

- How many of you have heard of "Alexa" ?

Q & A

Next generation of interactive computer marked assessments (iCMAs)

Cross-Language Learning for Program Classification using Bilateral Tree-Based Convolutional Neural Networks

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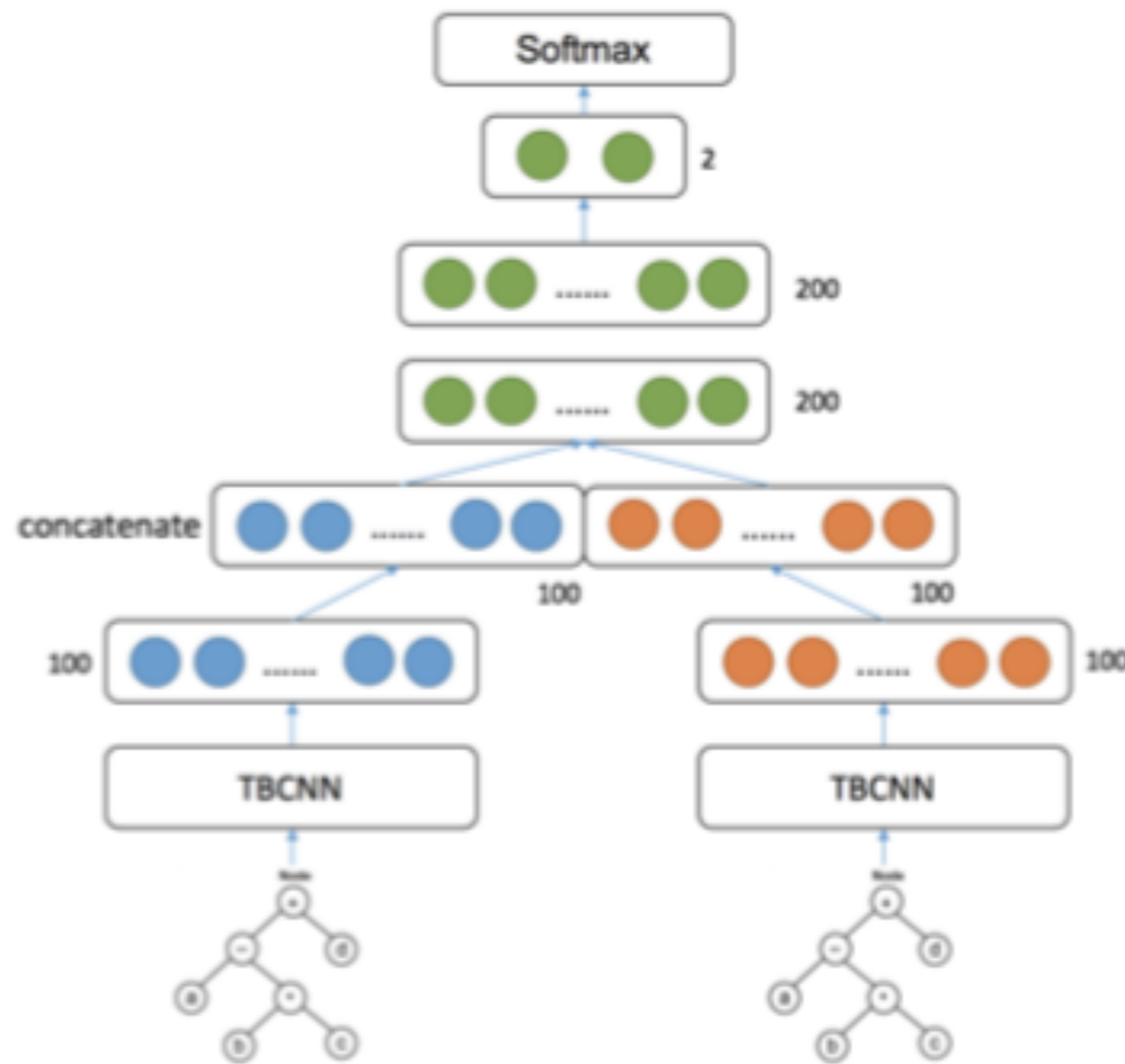yijun.yu@open.ac.uk

NL for SE @ AAAI 2018
https://nl4se.github.io

Figure 3: BiTBCNN architecture for program classification

Program Chairs

Prem Devanbu	University of California, Davis
William Cohen	Carnegie-Mellon University

Program Committee

Earl Barr	University College, London
Jacob Devlin	Google
Doug Downey	Northwestern University
Aditya Kanade	Indian Institute of Science
Ray Mooney	UT Austin
Graham Neubig	Carnegie-Mellon University
Tien Nguyen	UT Dallas
Charles Sutton	University of Edinburgh
Bogdan Vasilescu	Carnegie-Mellon University
Martin Vechev	ETH, Zurich

Program classification

Programmer

{algoName}

Repositories

{<algoName, lang., code>}

Parsers
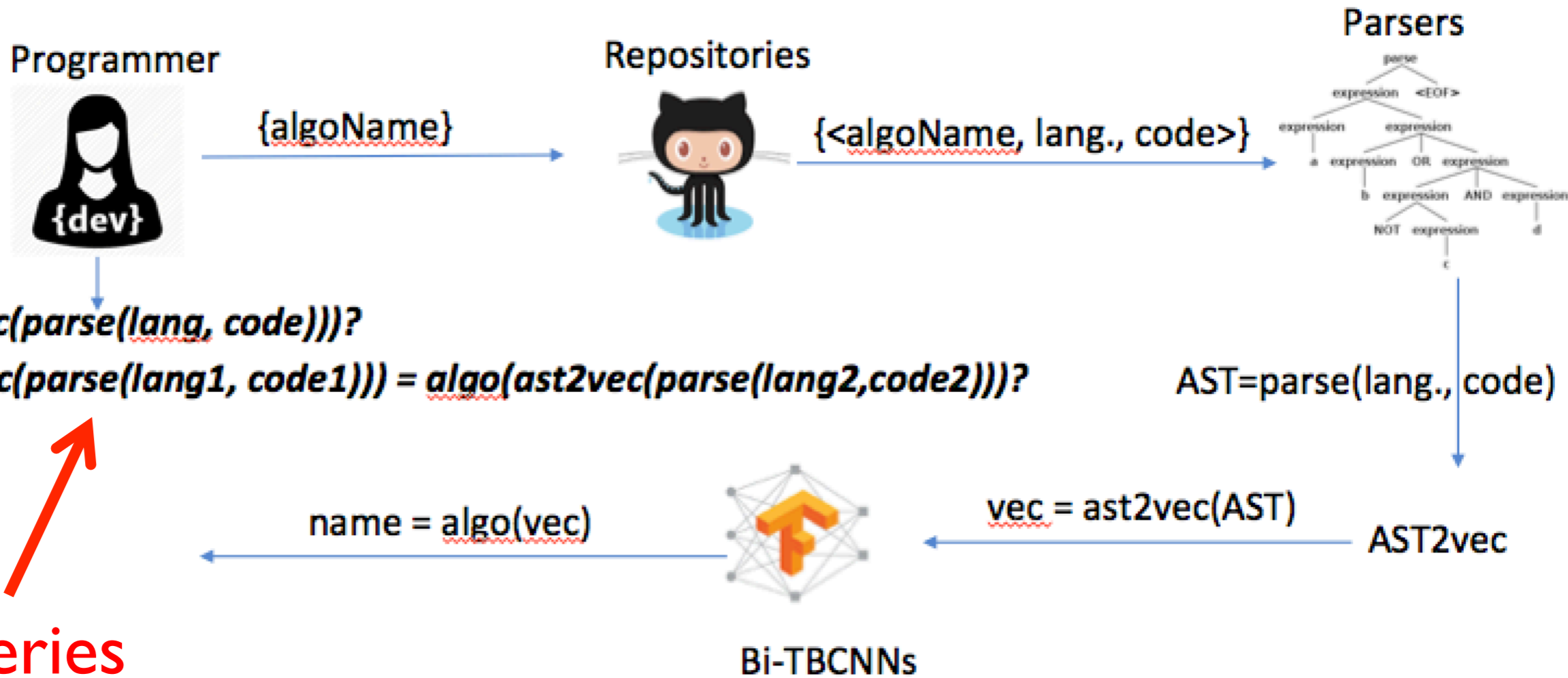
1. *algo(ast2vec(parse(lang, code)))?*
2. *algo(ast2vec(parse(lang1, code1))) = algo(ast2vec(parse(lang2,code2)))?*

AST=parse(lang., code)

name = algo(vec)

Bi-TBCNNs

vec = ast2vec(AST)

AST2vec

Queries
over 90% accurate

Teaching at a distance – a new form of iCMA