

Breaking Barriers: Advancements in Sign Language Automatic Translation

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FULL
POSSIBILITIES
FOR YOU

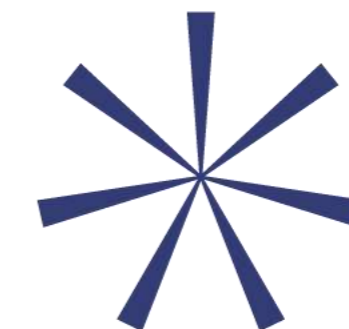


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Outline

1. Motivations
2. Sign languages vs Oral languages
3. VirtualSign Translation System
4. Projects and Applications
5. Future Work



Motivations

- Barriers to daily communication compromise the development of creative, emotional and social skills
... constraining future opportunities and social inclusion
- Deaf students have support in education at school level but not at higher education level

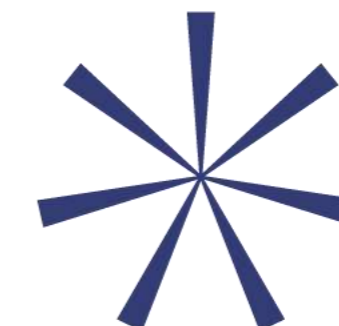
These barriers block the access of the deaf to higher education

... and have a negative impact on economy and social development by leaving behind irreplaceable potential

1. How many deaf students do you have at your institution?
2. How many deaf Erasmus students do you know?
3. How many deaf students who enrolled in higher education have succeed?

14.2% at bachelor level and 2,1% at master level Source: https://www.handsandvoices.org/articles/education/ed/V13-1_beyondHS.htm

- **Open the doors of higher education to deaf students, boost mobility of deaf students**
- **Assist/Facilitate the communication between deaf and non-deaf**
... promote equity and social inclusion



Sign languages vs Oral languages

The first language of deaf people is their national sign language

National oral language is a second language for deaf citizens, like English for most of us

Portuguese people cannot read English without training/assistance; our 1st language is Portuguese, not English

Deaf people cannot read Portuguese without training/assistance; their 1st language is Portuguese Sign Language, not Portuguese.

Sign languages are distinct from oral languages: syntax (form), semantics (meaning), and pragmatics (use)

Oral languages are **linear**: words, sentences. Sign languages are **visual**: spatial, signing

Sign languages are composed by 5 components: **hand configuration,**
location,
orientation,
body movement,
facial expression.

Sign languages vs Oral languages

BSL gloss, sequence of English words representing signs

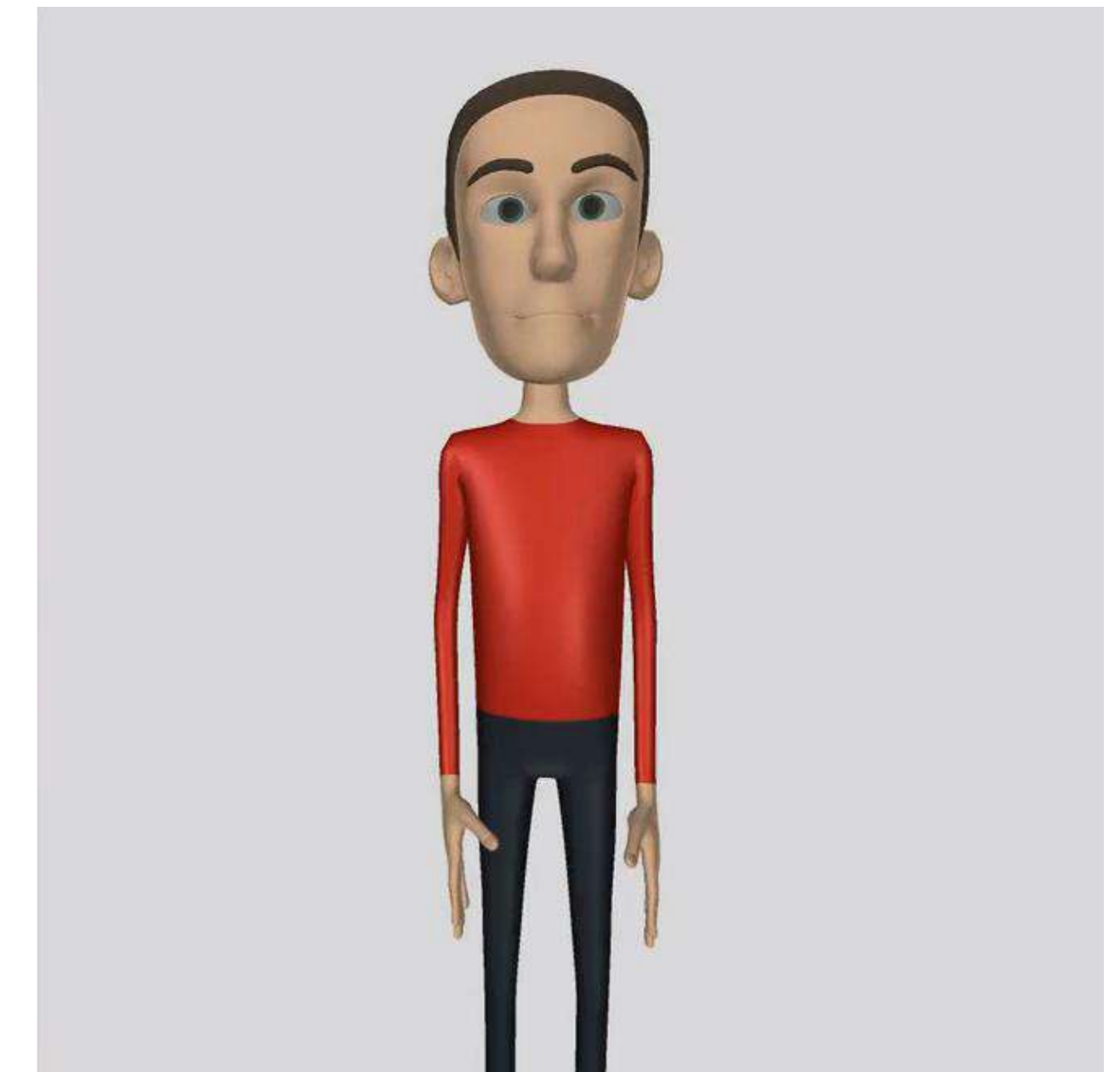
Come here Lollipop play time. Where? Lollipop head q. We will what? lot fun soft play things here. Will provide/give tea coffee for adult. Play session include lunch children only. Please you arrive on time. If late text on 0123 456789. Plus children must supervise.

English

Come along to Lollitots Playtime at Lollipop HQ! We will be having so much fun with the amazing soft play activities that will be here! There will be tea and coffee facilities for the adults and this session includes lunch for the children. Please arrive as promptly as you can. If you're running late, please let us know by sending a text to 0123 456789.

NB: Children must be supervised at this activity.

British Sign Language



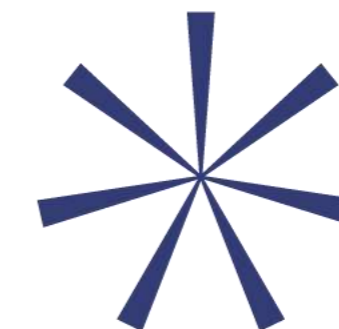
VirtualSign



A technology for automatic bi-directional translation between sign and oral languages
in development since 2012.



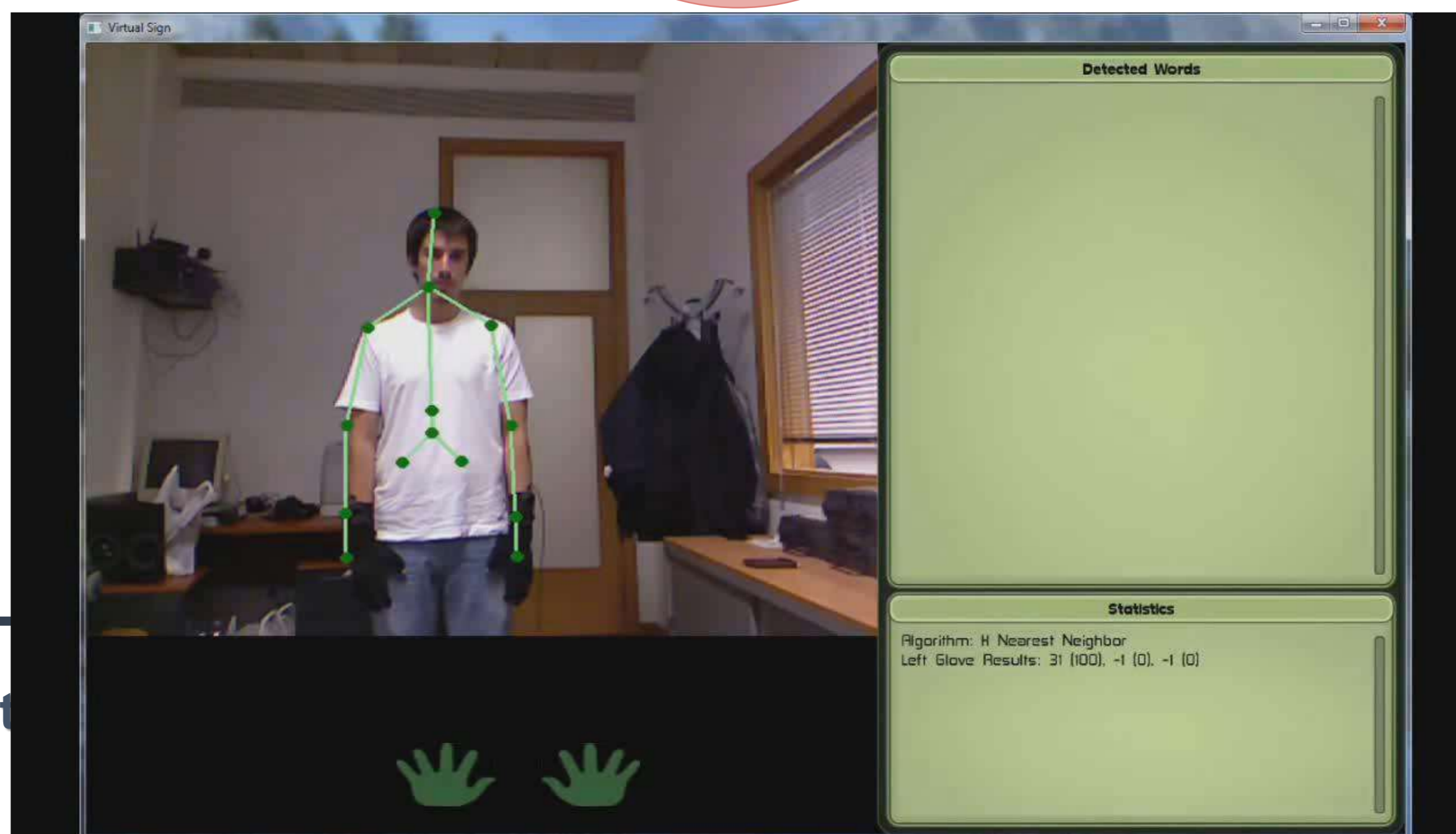
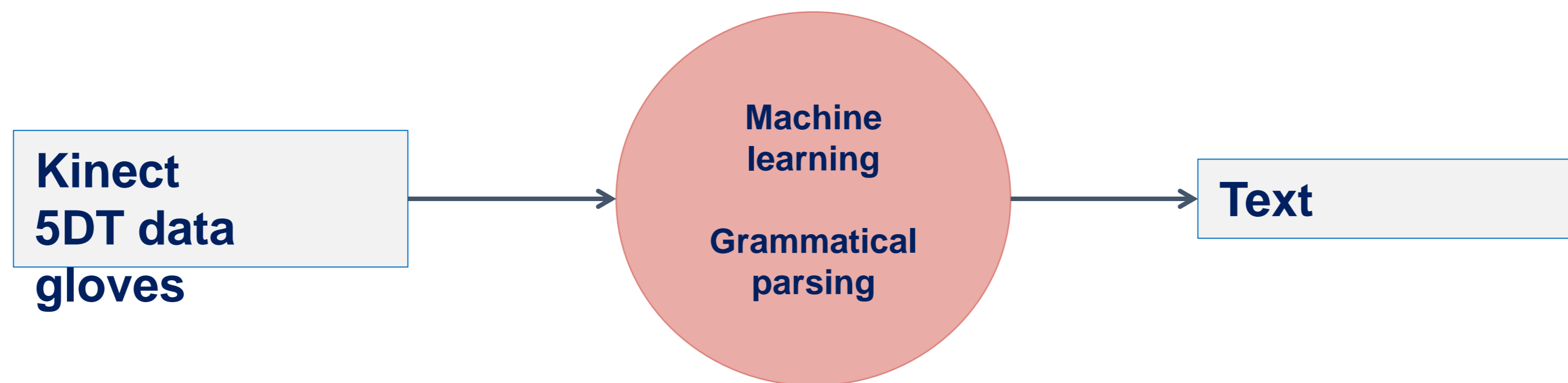
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VirtualSign

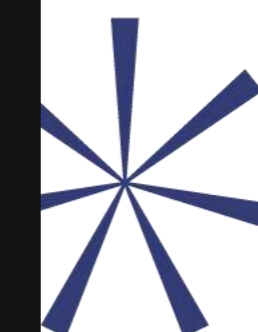


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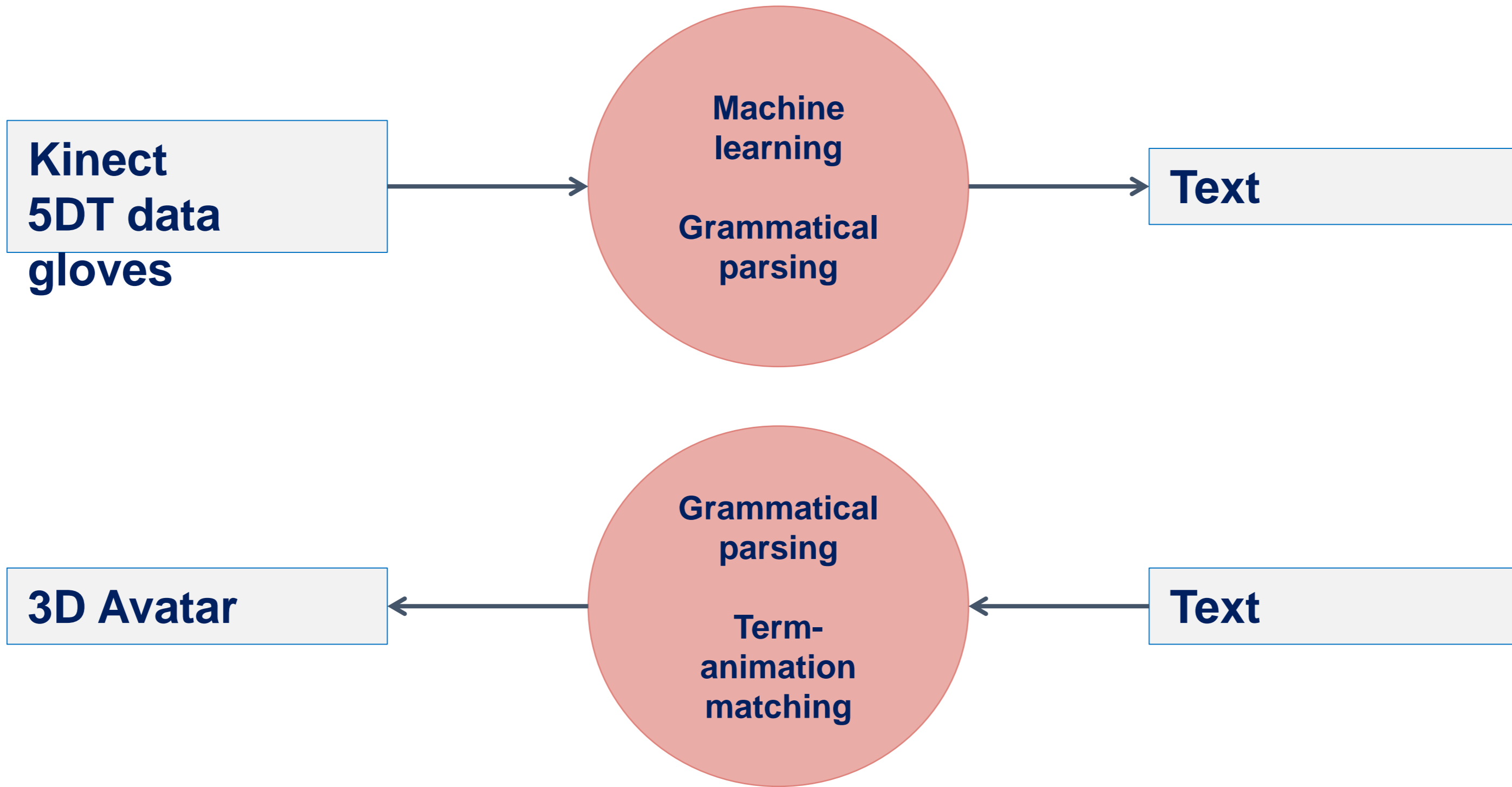
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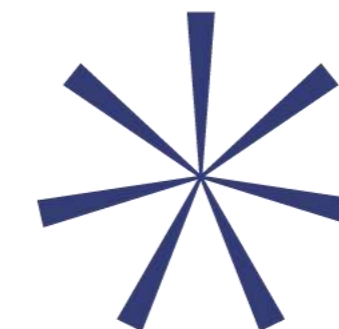


VirtualSign

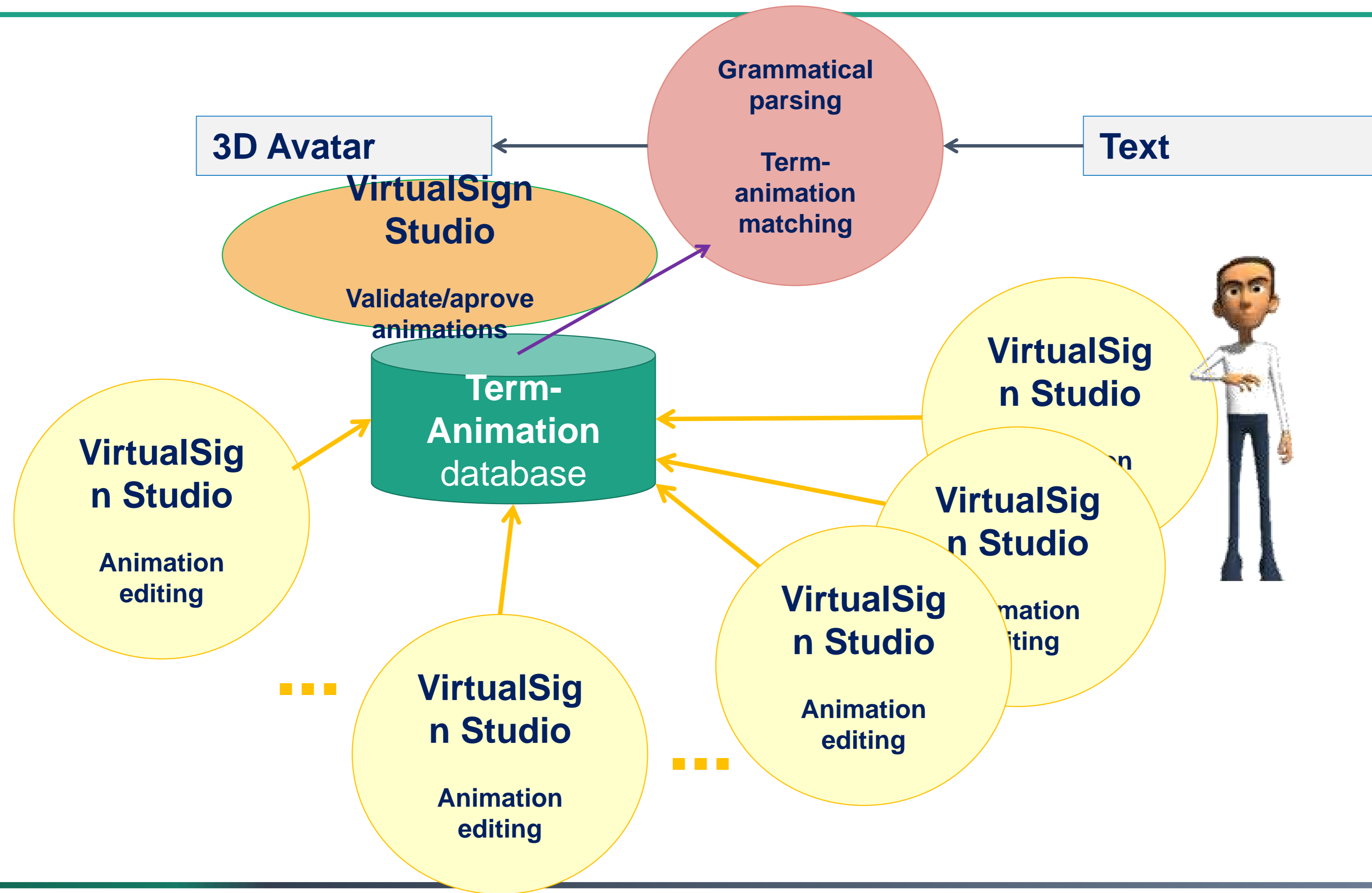


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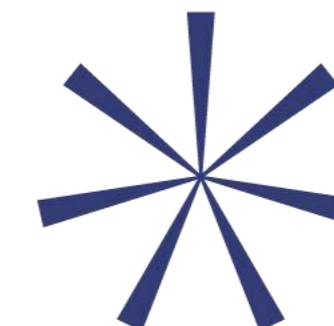


VirtualSign



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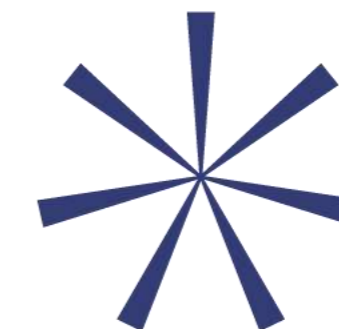
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Project and Applications: Research & Innovation

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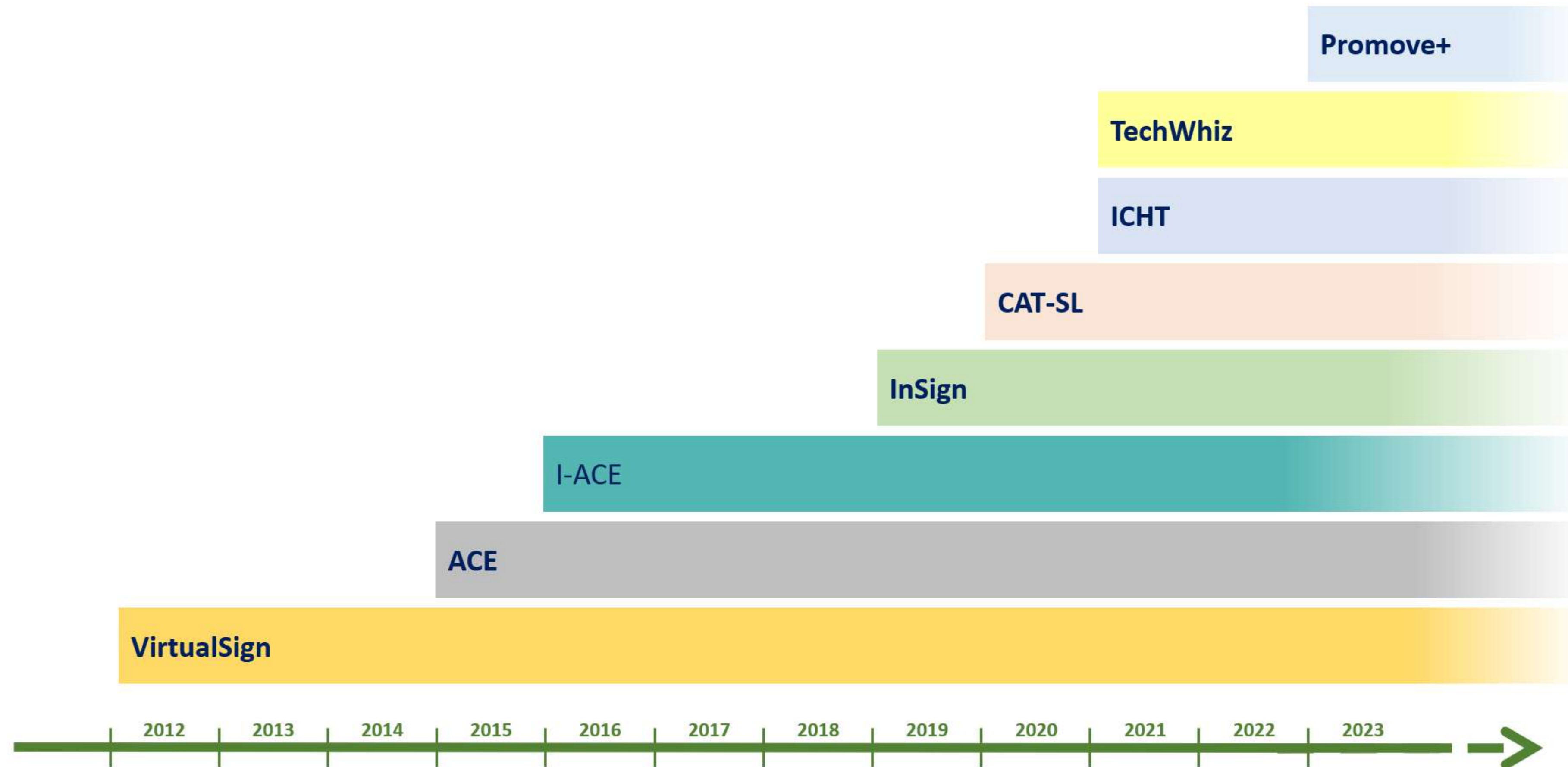
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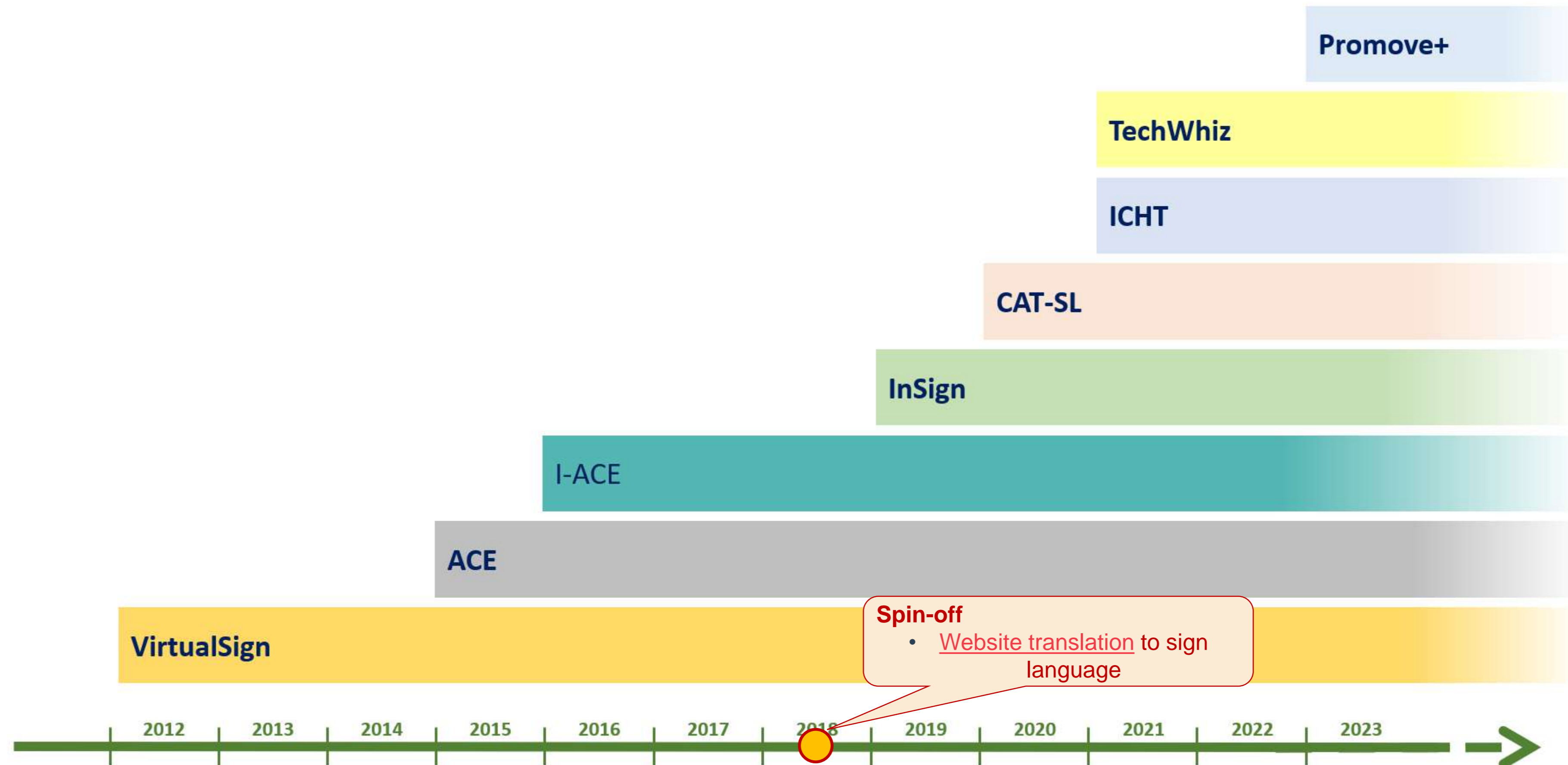
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Project and Applications: Research



Project and Applications: Innovation



Project and Applications: VirtualSign



Project and Applications: ACE



ACE

Partners

- Polytechnic of Porto, GILT Research Group, Portugal
- University of Porto, Portugal
- Open University, Portugal
- Municipality of Lousada
- Associação Lousadense dos Deficientes, dos seus Amigos e Familiares

Budget

200 K€

Timeframe

2015 till 2018

Funding Agency

National Foundation for Science and Technology (Portugal)

Outcomes

- **Agnostic bi-directional translation model**, translating to any sign/oral language pair; dialects; context
- **LIBRAS**
- **VirtualSign v1**
- **VirtualSign Data Gloves**, cooperation with the Federal Institute of Goiás

Applications: I-ACE

I-ACE

Partners

- Polytechnic of Porto, Portugal
- Hellenic Mediterranean University, Greece
- University of Siegen, Germany
- University of York, England
- University of Maribor, Slovenia
- Municipality of Porto, Portugal
- European Association of Career Guidance, Cyprus

Budget

270 K€

Timeframe

2016 till 2018

Funding Agency

EACEA – European Education and Culture Executive Agency, EU

Outcomes

- Adding the sign languages of **Greece, Germany, England, Slovenia and Cyprus**
- Comprehensive report on the State-of-the-Art in Respect to the Deaf in Education at the partner countries
- **Sign language video generator**
- **Online sign language translation tool**
- Sign language assistant at the Metro of Porto



Project and Applications: InSign

InSign

Partners

- University of Siegen, Germany
- Polytechnic of Porto, Portugal
- Hellenic Mediterranean University (TEI), Greece
- University of Maribor, Slovenia
- European Association of Career Guidance, Cyprus

Budget

298 K€

Timeframe

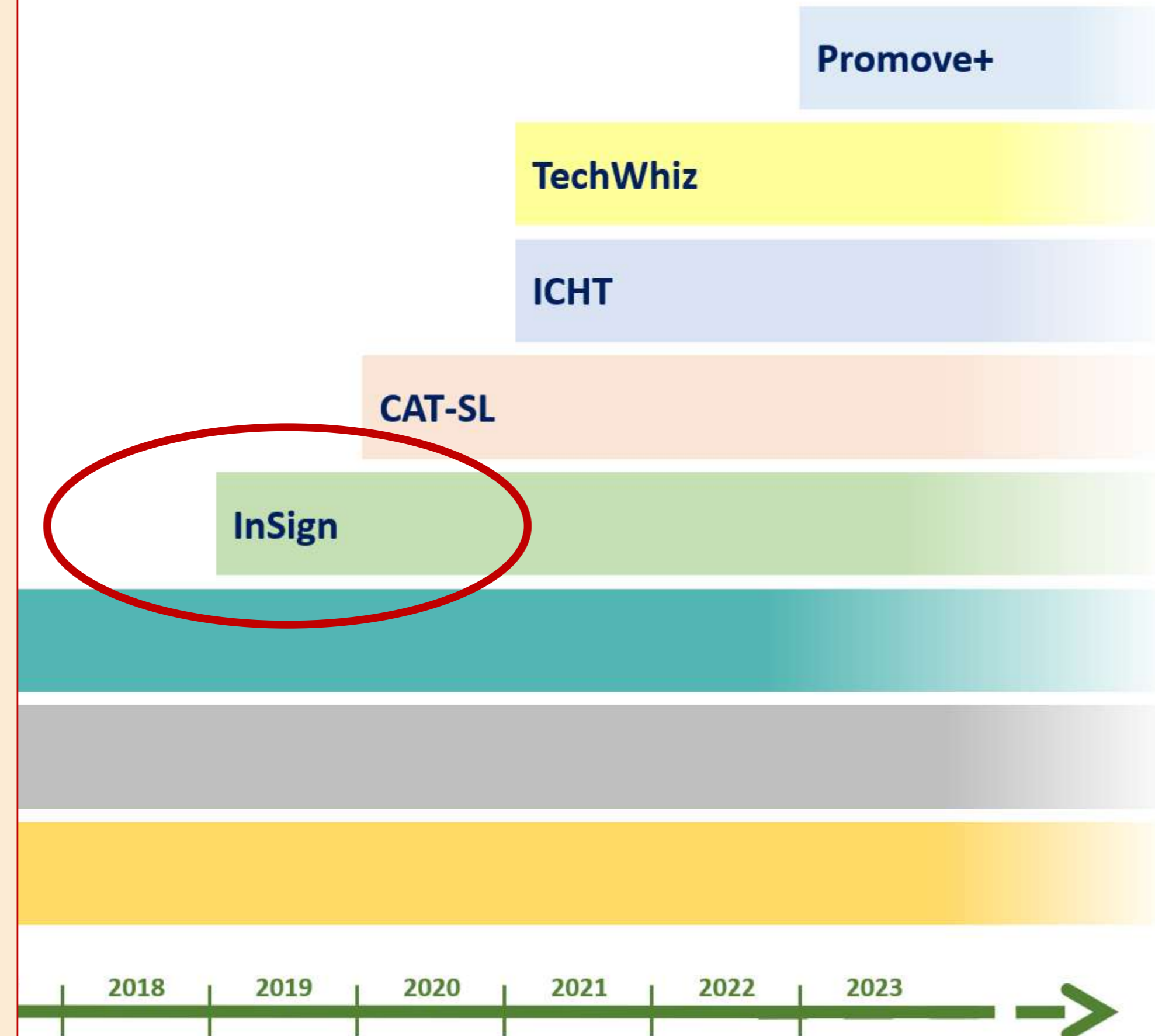
2019 till 2022

Funding Agency

EACEA – European Education and Culture Executive Agency, EU

Outcomes

- Integration of **International Sign** in VirtualSign, [online translator](#)
- IS as a globalized lingua franca [E-book](#) published in five European languages
- International Sign [course](#) for deaf learners
- International Sign [course](#) for non-deaf learners



Applications: CAT-SL

CAT-SL

Partners

- University of Patras, Greece
- Polytechnic Institute of Porto, Portugal
- Technological University of Cyprus, Cyprus
- Hellenic Mediterranean University, Greece
- Royal Kentalis, The Netherlands

Budget

260 K€

Timeframe

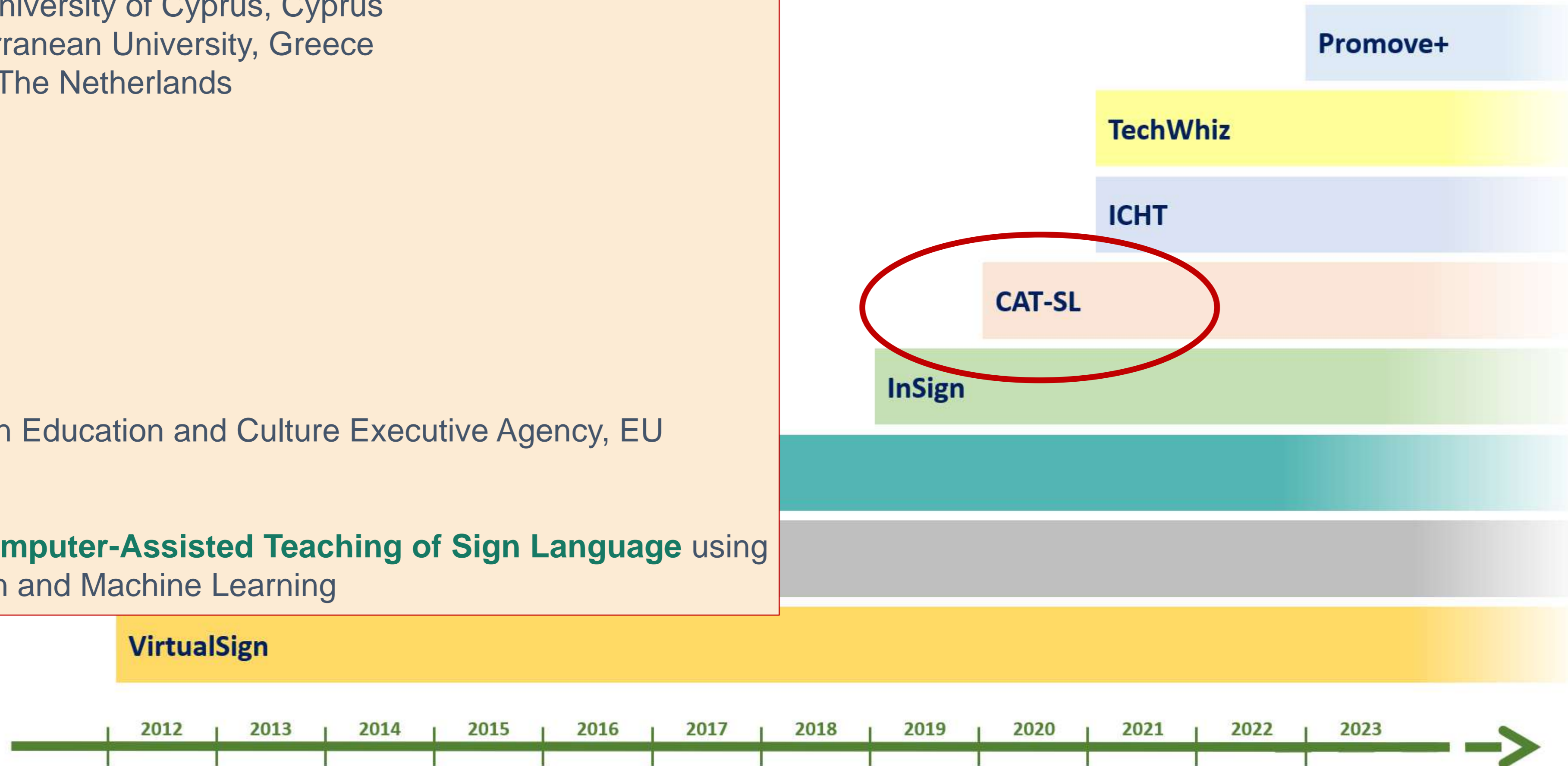
2020 till 2023

Funding Agency

EACEA – European Education and Culture Executive Agency, EU

Outcomes

- A system for **Computer-Assisted Teaching of Sign Language** using Computer Vision and Machine Learning



Applications: ICHT

ICHT

Partners

- Medidata S.A.
- Polytechnic Institute of Porto, Portugal
- Polytechnic Institute of Viseu, Portugal
- Cilab Research Lab, Design Department of Politecnico di Milano, Italy
- Innovation Centre for Assistive Technologies, Institute of Tourism, HES-SO Valais-Wallis Switzerland
- Trier University of Applied Sciences, Germany

Budget

993 K€

Timeframe

2021 till 2023

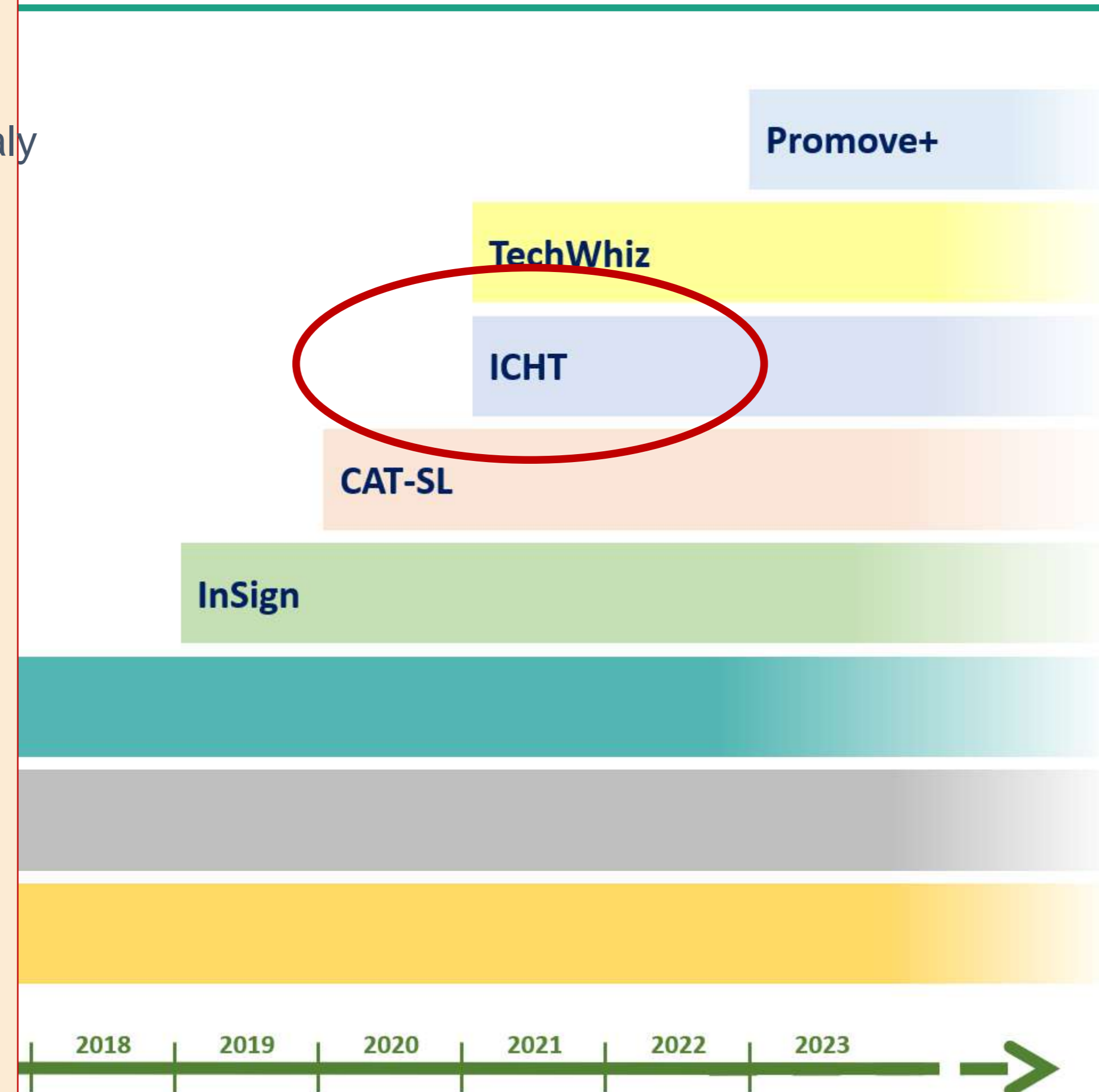
Funding Agency

Compete (Portugal)

European Structural and Investment Funds (EU)

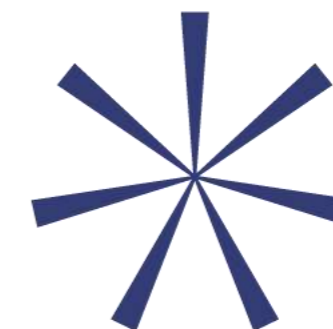
Outcomes

- **Holographic** sign language interface
- Game for tourists in sign language, link to the local culture
- Promoting **inclusive tourism**, Cultural Heritage Tourism



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Applications: TechWhiz

TechWhiz

Partners

- Medidata S.A.
- Polytechnic Institute of Porto, Portugal
- Hellenic Mediterranean University, Greece
- University of Siegen, Germany
- University of Maribor, Slovenia
- European Association of Erasmus Coordinators, Cyprus

Budget

297 K€

Timeframe

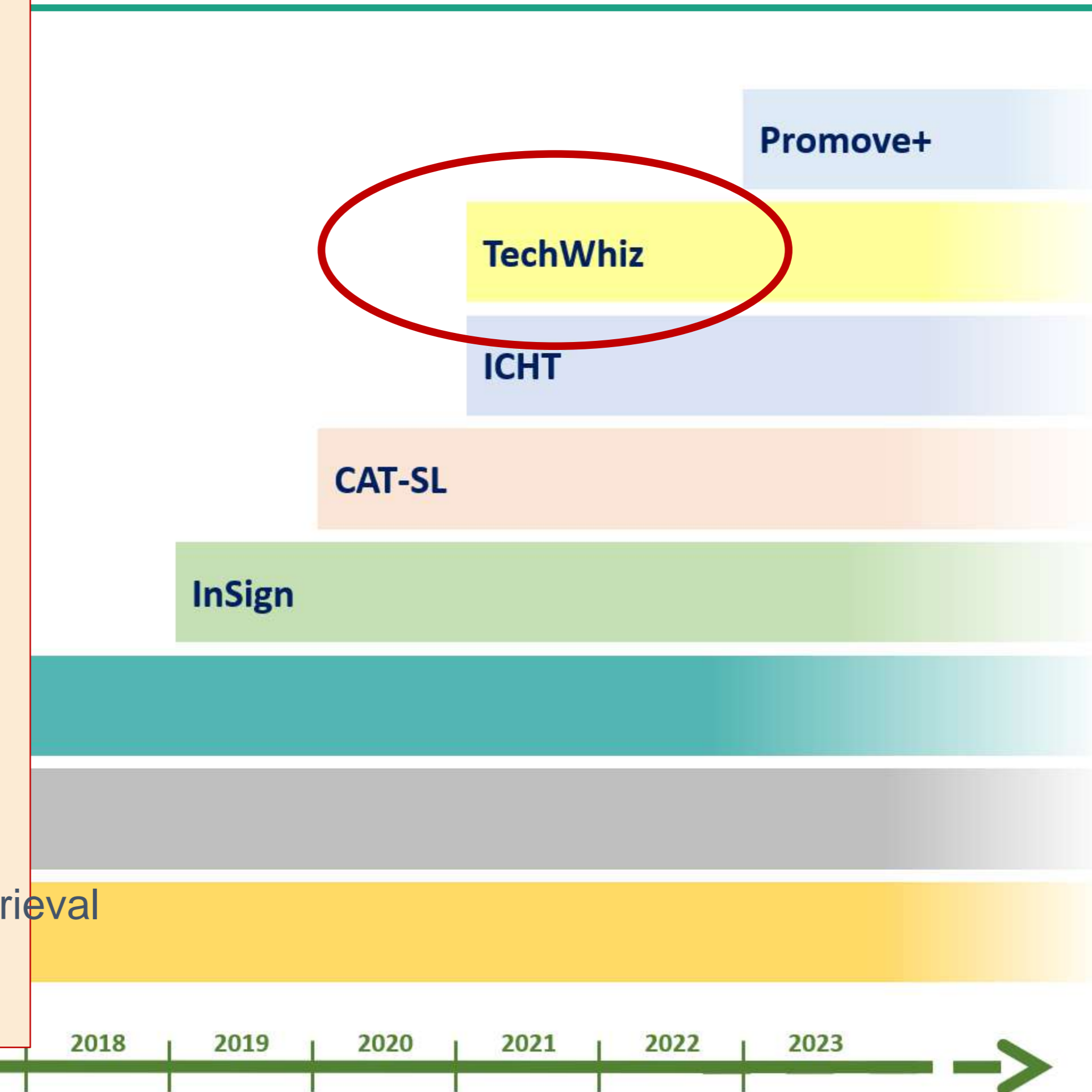
2012 till 2015

Funding Agency

EACEA – European Education and Culture Executive Agency, EU

Outcomes

- **Gloss Loader**, crowdsourcing for gloss
- Sign Language **Technical Glossary**, web scrapping, information retrieval



Project and Applications: Promove+

Promove+

Partners

- Polytechnic of Porto, Portugal
- Hellenic Mediterranean University, Greece
- University of Vigo, Spain

Budget

5 K€

Timeframe

2023

Funding Agency

Polytechnic Institute of Porto, Portugal

Outcomes

- Course in **Gender Equality strategies translated to LGP**

VirtualSign

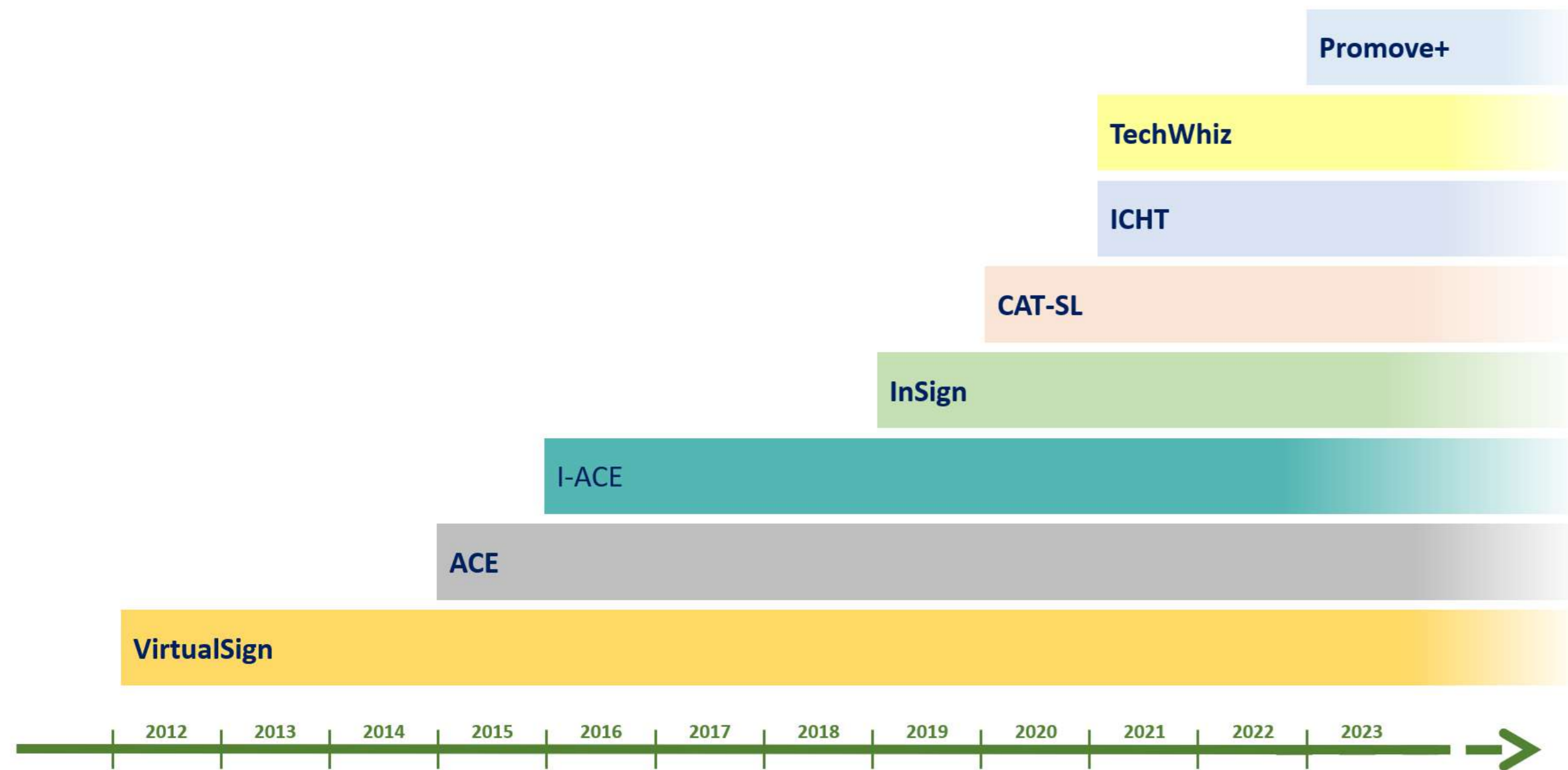
Promove+

chWhiz

HT



Project and Applications: the Way Forward



- HE course materials in national sign languages
- Improve facial expression
- Improve machine translation
- Train interested people
- Collect corpora for machine translation

Ευχαρίστο!

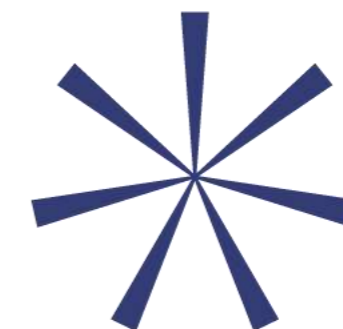
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