UiT

THE ARCTIC UNIVERSITY OF NORWAY

Norwegian Ministry of Local Government and Modernisation

SÁMEDIGGI

SÁMI PARLIAMENT

Is it possible to create computer tools for indigenous languages?

ÁBČ Divvun

Giellatekno

2019 | INTERNATIONAL YEAR OF Indigenous Languages

UNIVERSITY OF TROMSØ

The Divvun and Giellatekno groups at UiT

- **Divvun (tool development):**
  - Børre Gaup
  - Elena Paulsen
  - Linda Wiechetek
  - Sjur Moshagen
- **Giellatekno (academic research):**
  - Lene Antonsen
  - Trond Trosterud
- **More people at home (altogether 11)**

Romsa / Tromsø

Tools

- Computer keyboards
- Cell phone keyboards
- Word analysers
- Dictionaries with grammar
- Spelling checkers
- Phone keyboards with spellers
- Word form generation
- Hyphenation
- Language learning tools
- Grammar checkers
- Machine translation

Computer keyboards

- On Windows the keyboard installer also registers the locale
- Makes Windows *know your language*
- Similarly on macOS

Computer keyboard for Skolt Sámi

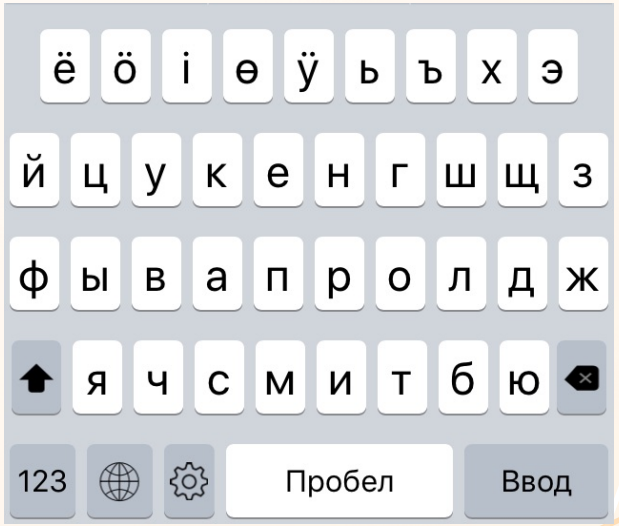
Cell phone keyboards

North Sámi cell phone keyboard

… for any syllabic or alphabetic writing system

Prototype Cree Syllabic keyboard

In cooperation with AltLab at University of Alberta



Prerelease Komi Cyrillic keyboard

In cooperation with FU-lab in Syktyvkar

Spelling checkers

The spelling checkers work on:

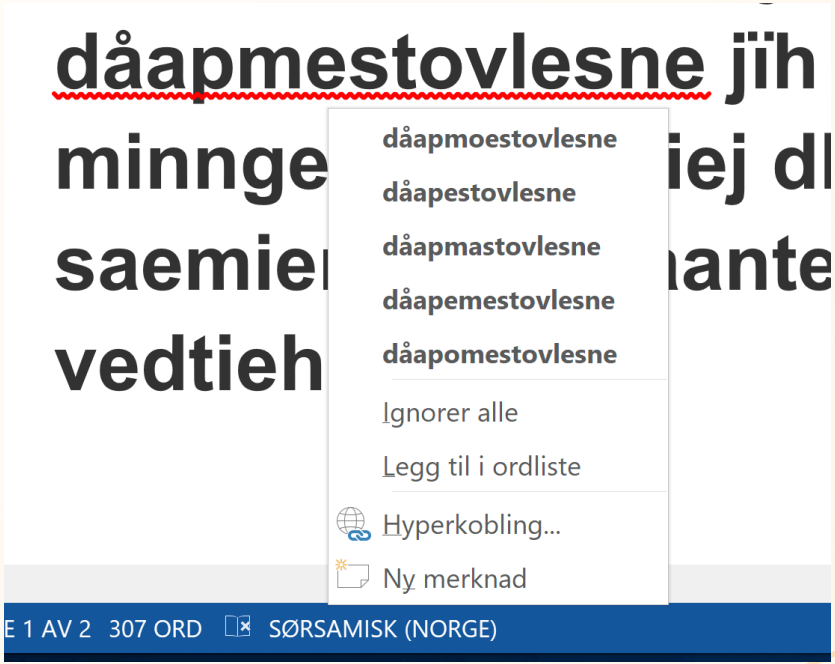
- Linux, macOS, Windows

They are:

- open source & fast

They work with:

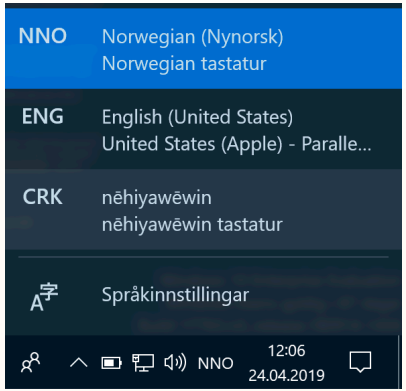
- MS Office
- LibreOffice
- Web apps
- … and more

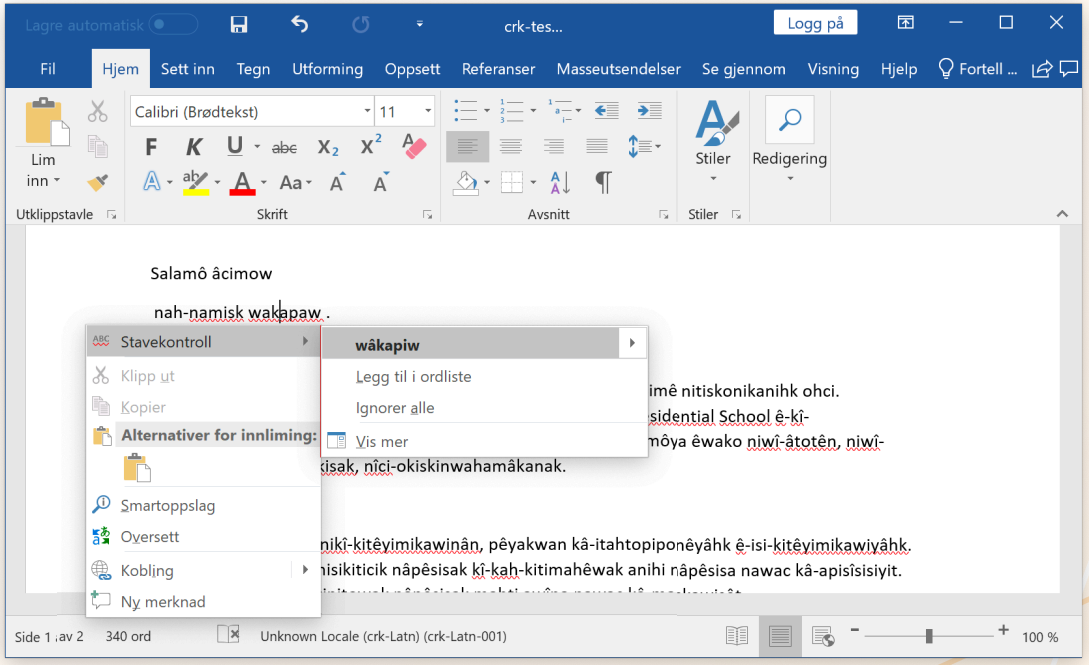


Spelling checker for South Sámi in MS Word

… for all languages

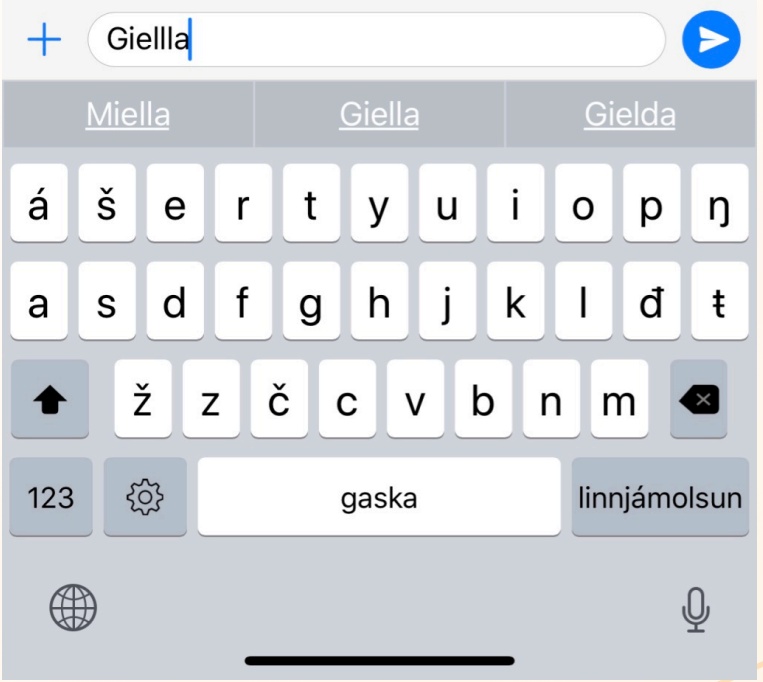
- Prerelease Cree speller
- Works in MS Word
- *With the correct language code*





Cell phone keyboards with spelling checkers

- Fast and responsive
- Available for:
  - Android
  - iPhone
  - Chromebook coming soon

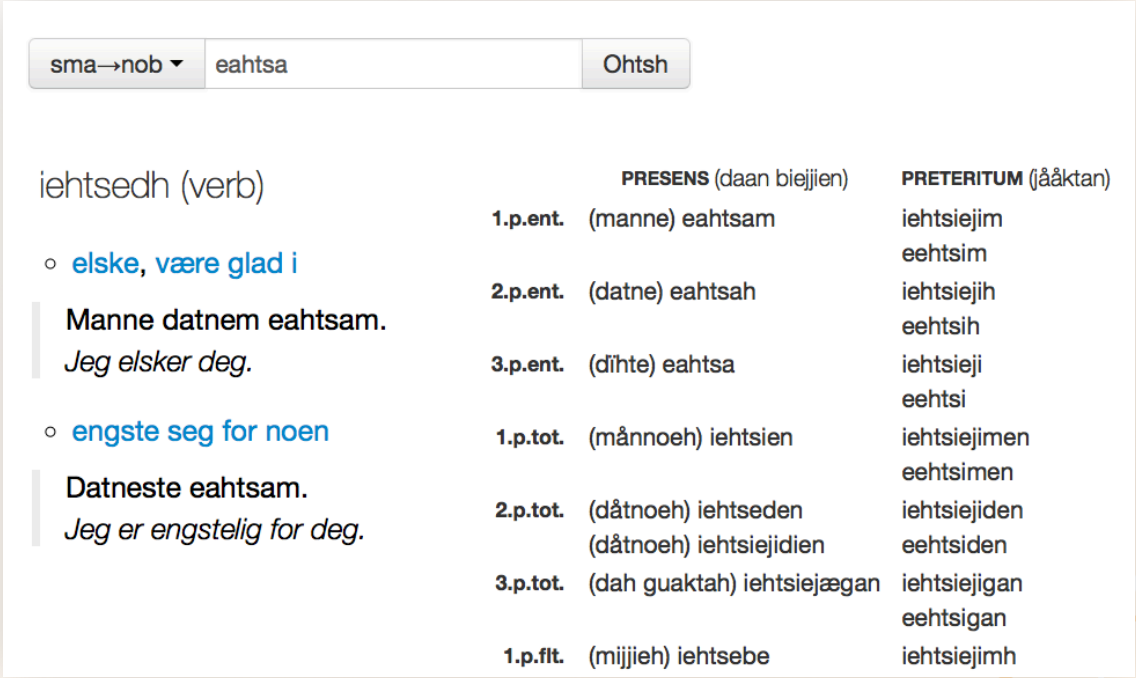


North Sámi cell phone keyboard with spelling checker

Dictionaries with grammar

Includes:

- Analyser to look up any word form
- Generator to generate paradigm



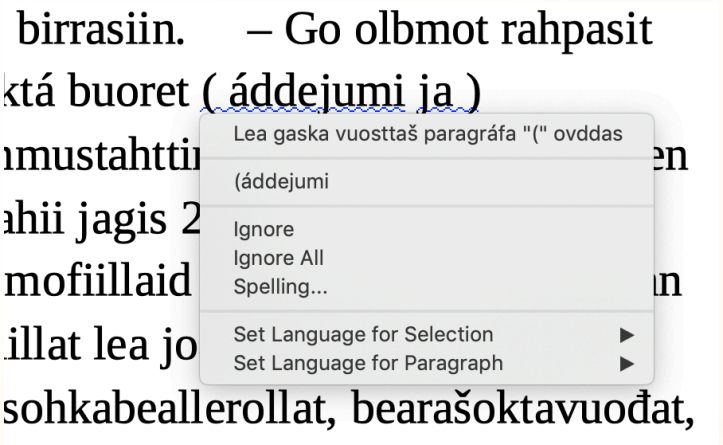
South Sámi dictionary

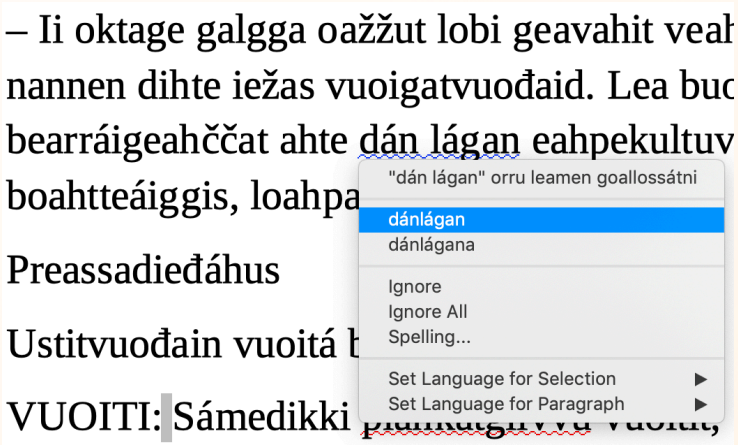
Language learning tools

- Using our analysers to give better feedback
- … and to create dynamic exercises from real texts

North Sámi language learning webapp

Grammar checkers





North Sámi grammar checker

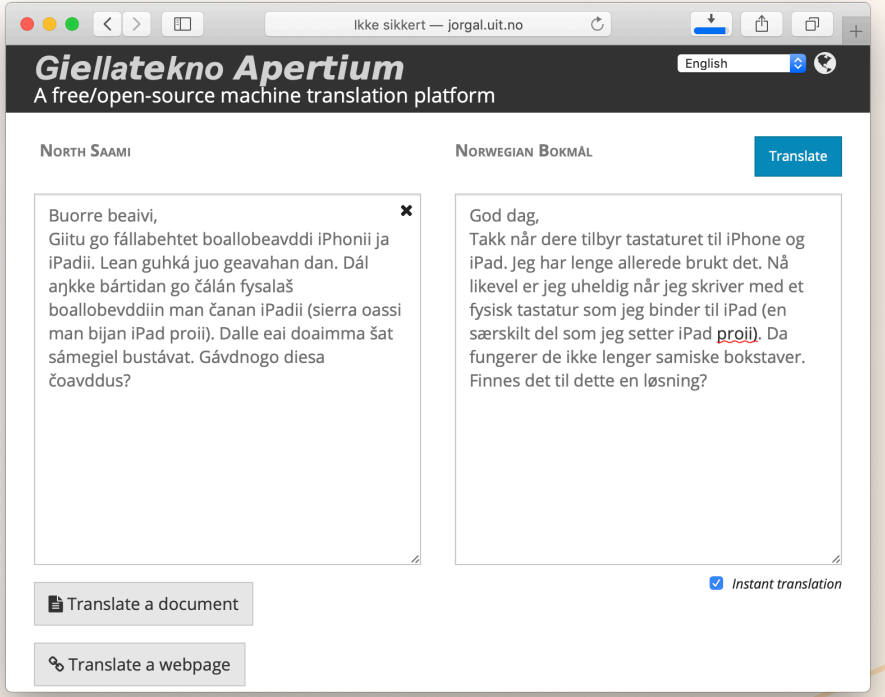
Machine translation

Translate:

- Text as you type
- Documents
- Web pages

Main point:

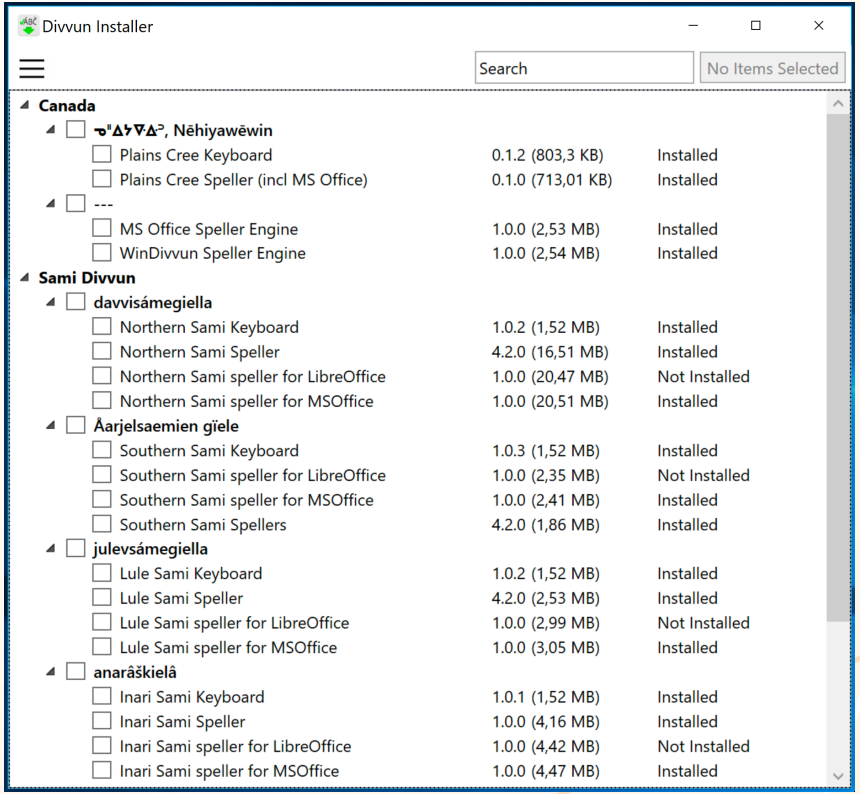
- Frees the indigenous community from having to use the majority language



North Sámi to Norwegian machine translation

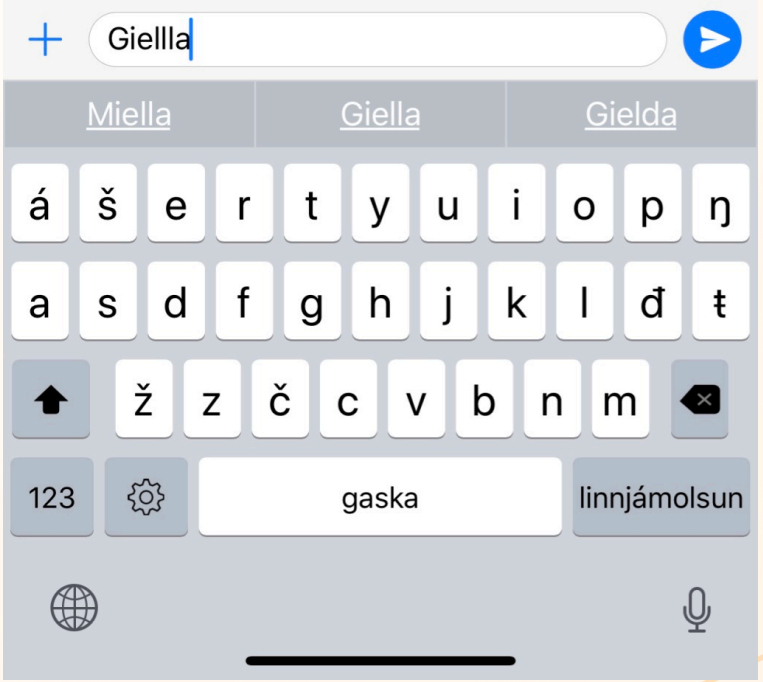
The Divvun Installer

- Windows & macOS
- A tool to install all writing aids
- Keep all tools up-to-date



Demo 1

- North Sámi keyboard with speller



Demo 2

- You write this …

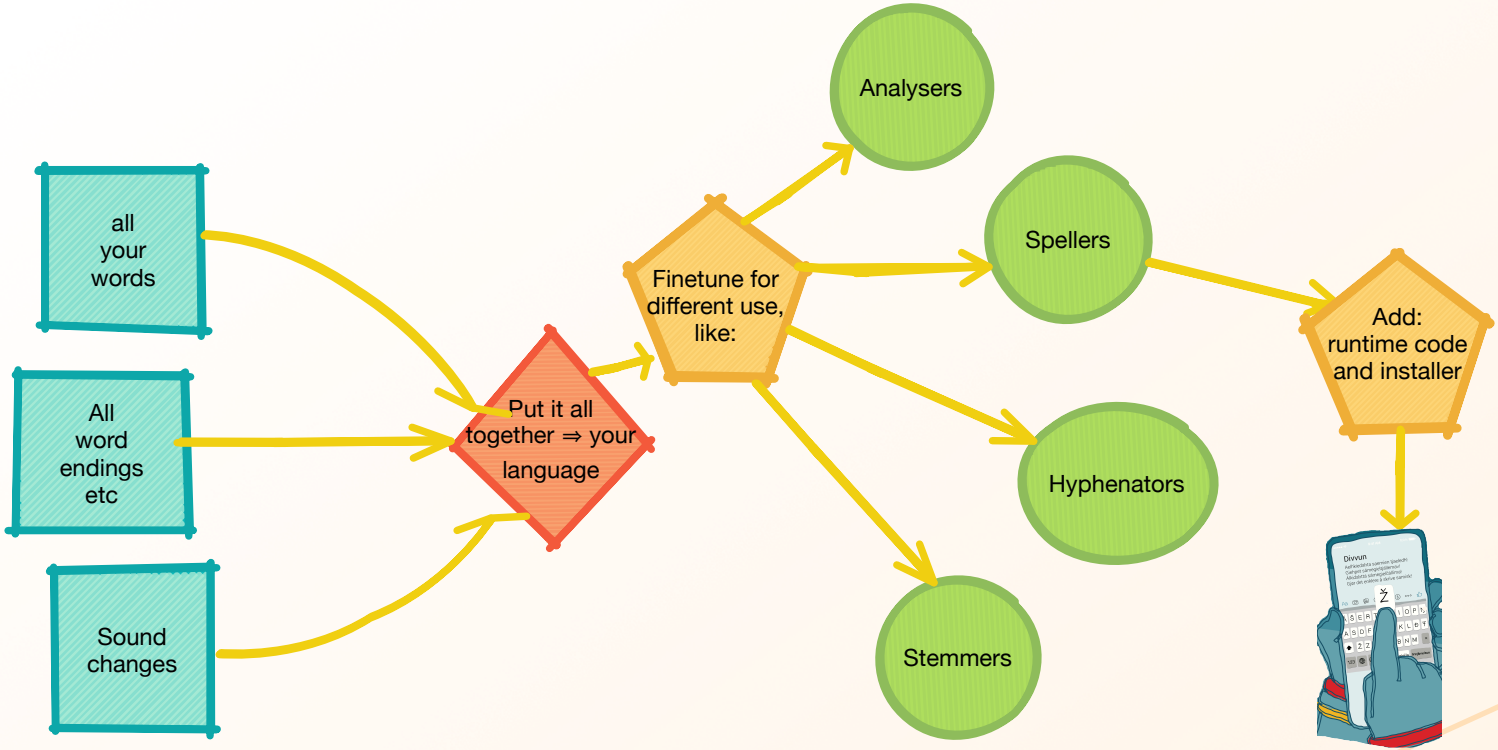
```
modes:
  mobile:
    default: |
      ᐳ ᒍ ᑐ ᐅ ᔪ ᒧ ᑯ ᓄ ᓱ ᐧ ᐟ ᐠ
      ᐸ ᒐ ᑕ ᐊ ᔭ ᒪ ᑲ ᓇ ᓴ ᐦ ᐦ ᑐ
      ᐱ ᒋ ᑎ ᐃ ᔨ ᒥ ᑭ ᓂ ᓱ ᑊ ᐩ ᑫ
       ᐯ ᒉ ᑌ ᐁ ᔪ ᒣ ᑫ ᓄ ᓴ ᐪ ᑦ
```

and get this …

… on your phone:

Instant cell phone keyboard! Try hands-on after the talk!

How did we do it?



Our infrastructure

- Free and open
- Code publically available in *Github* and *Subversion*
- Encourages reuse
  - One source for all tools
- Rule based → *any* language
- … even without digital texts

Issues we do not control

- **Main obstacle:** Computer systems are closed
  - Most systems only recognise a couple of hundred languages, the vast majority of languages are left out
- Language technology such as Siri, Amazon Alexa, Google Translate is important to the big companies, and they keep it to themselves
  - As a consequence, all indigenous languages are blocked from their systems
- Example: machine translation

Solution

- Open up
- Clearly defined interfaces
  - => we can implement tools

- Mainstream language technology not fit for most indigenous languages

- We have working technology — but are often not allowed to use it

- Language communities must control their own language technology

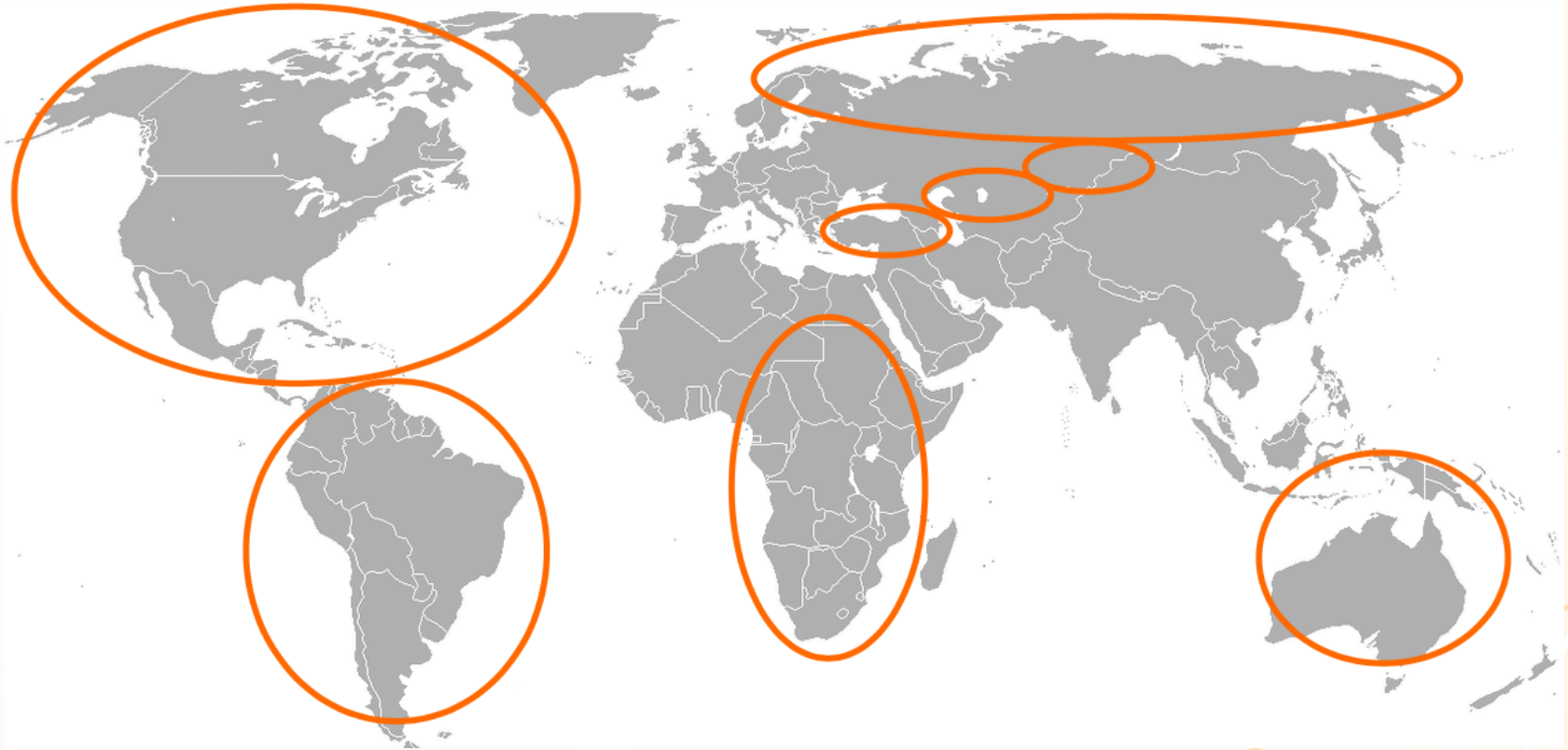
Most languages need a computational model of their grammar

This holds for:

- *All indigenous languages* (except the ones in Polynesia)
- At least 2/3 of the world's 7000 languageas
- For some languages a computational model may come in handy, but they may also do without

Note:
The smaller amount of text that is available for the language,
the stronger is the need for a computational model of the grammar

Areas with highly inflecting languages



Indigenous languages with computational models

At least the following languages (those with released tools are **boldfaced**) with / without our infrastructure:

- *Nordic countries:* **South, Pite, Lule, North, Inari** and **Skolt Sámi**
- *North-East:* Tundra Nenets, Evenki, North Mansi / Chukchi
- *North-West:* North Slope Iñupiaq, **Greenlandic** / Inuktitut
- *North America:* Plains Cree, Northern Haida, Odawa, Tsuut'ina / Navajo
- *South America:* / Aymara, **Kichwa**, Cuzco Quechua, Guaraní

… and several more. The number of grammar models is rising

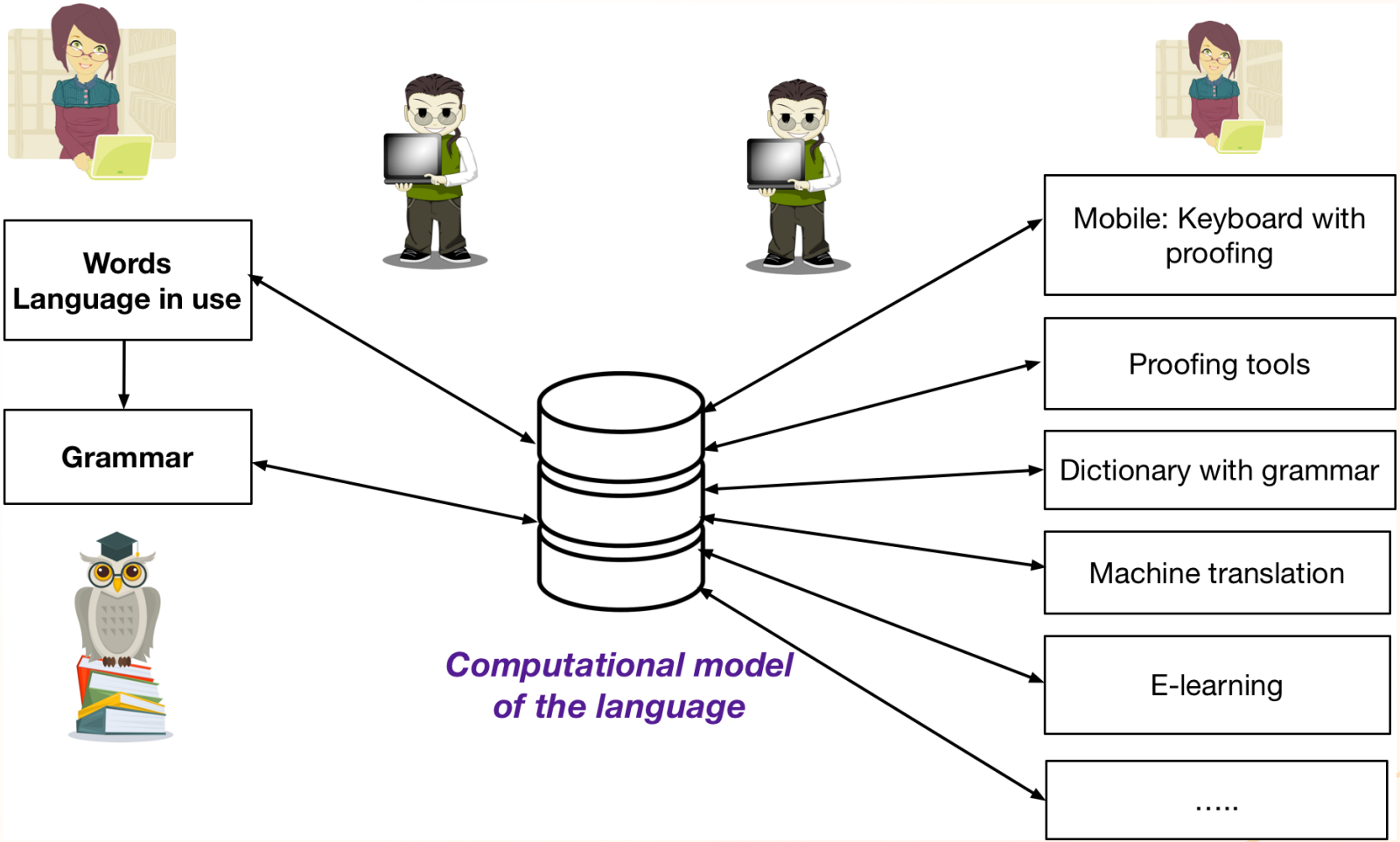
Unfortunately, too many computational models are not turned into tools

How to do this in practice

Linguist

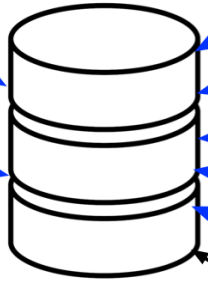
Language expert

Programmer


Words
Language in use
Grammar
Computational model
of the language
Mobile: Keyboard with proofing
Proofing tools
Dictionary with grammar
Machine translation
E-learning
.....

Words
Language in use

Grammar



This is possible for every language:
We offer open source infrastructure and integration into end-user programs.

Mobile: Keyboard with proofing	*iPhone Android …*
Proofing tools	*MS Office Libre O …*
Dictionary with grammar	*E-dict-ionary*
Machine translation	*Apertium*
E-learning	*Oahpa View …*
…..	…

Conclusion

- Yes, it **is** possible to create computer tools for indigenous languages
- No quick fix — good tools require a lot of work
- … done by the language community with linguists and programmers
- GiellaLT infrastructure is one way of turning the computational model of the language into practical programs
- Provides working solutions used every day by indigenous communities

For more information:

We will be around here till Friday

indigenous-langtech.uit.no