Libre Software in Africa

1. Libre Software in Africa

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https://tuvutepamoja.africa

2. Outline

- Background
- Digitization and Libre Software
- Language Data, Machine Learning and Privacy

3. Introduction

- Africa
  - 1.39 billion people [WEA]
  - $2260 Nominal GDP per capita [WEA]
  - 3.9% Real Economic GDP growth rate [WEA]
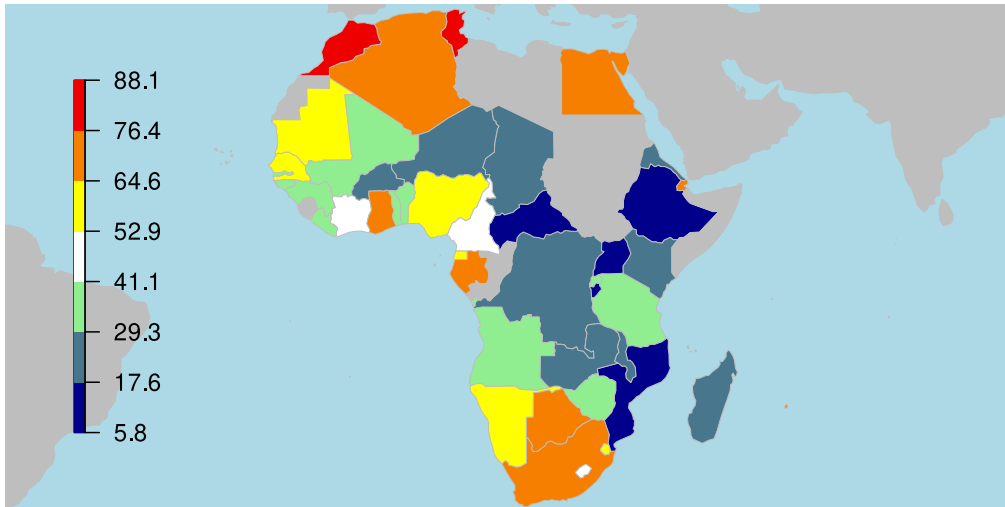 - 10.7% of households have a computer [ITUFF19]

4. Overview of Internet Connectivity

- 0.4 fixed broadband internet subscriptions per 100 people [ITUFF19]

- 34.8 active mobile internet subscriptions per 100 people [ITUFF19]

- 17.8% of households have internet access [ITUFF19]
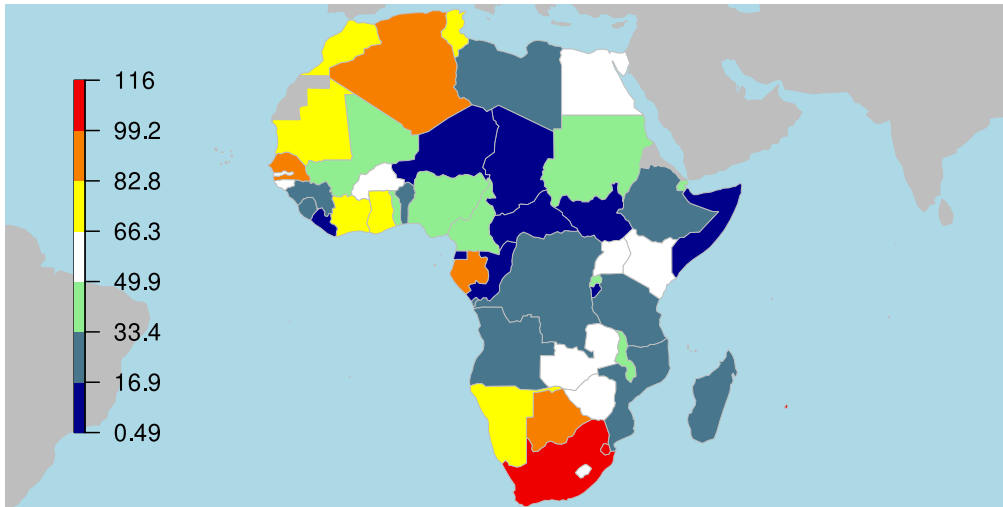
5. Percent Individuals Using the Internet

- Percent of individuals in each country using the internet in 2021 [ITUDH]

6. Mobile Broadband Bandwidth Subscriptions
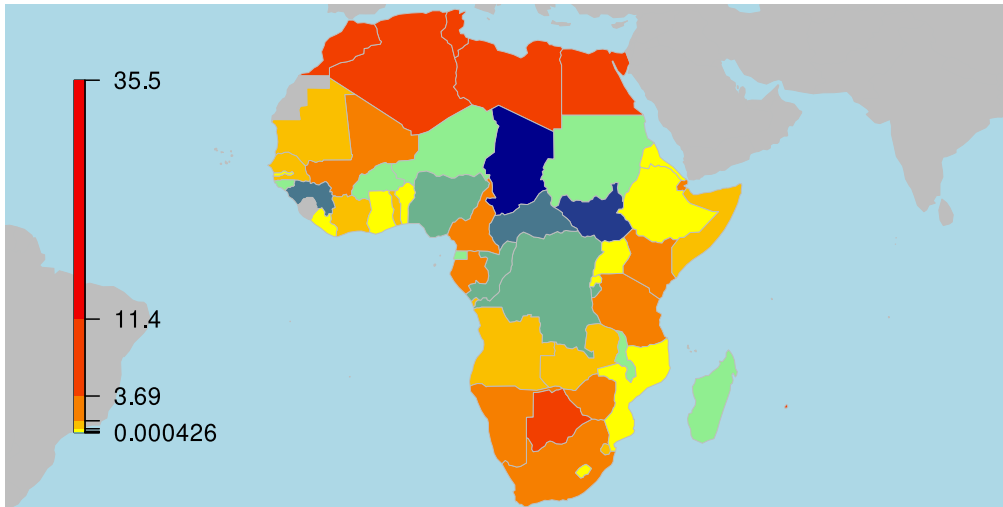
- Mobile broadband bandwidth subscriptions per 100 people in 2021 [ITUDH]

7. Fixed Broadband Bandwidth Subscriptions
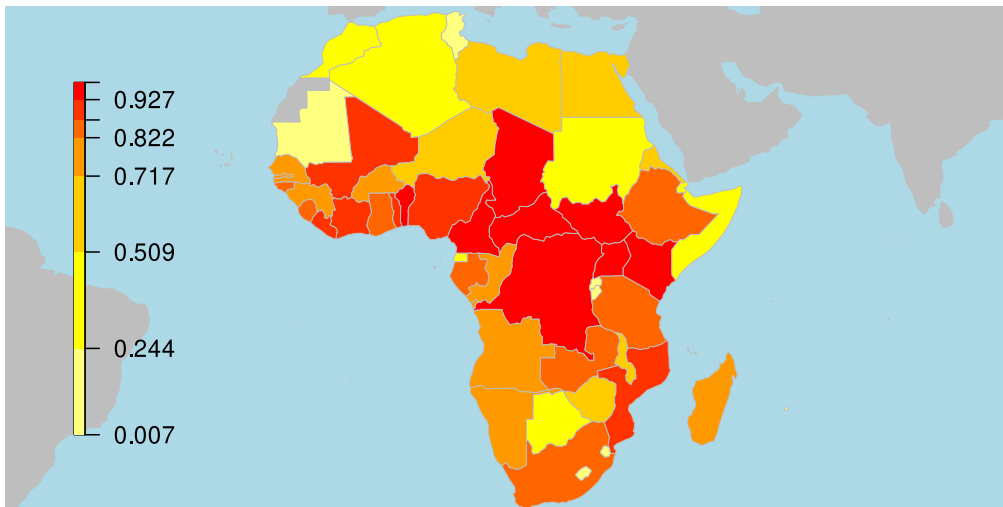
- Fixed broadband bandwidth subscriptions per 100 people [ITUDH]

8. Language Diversity

- Continent with largest language diversity
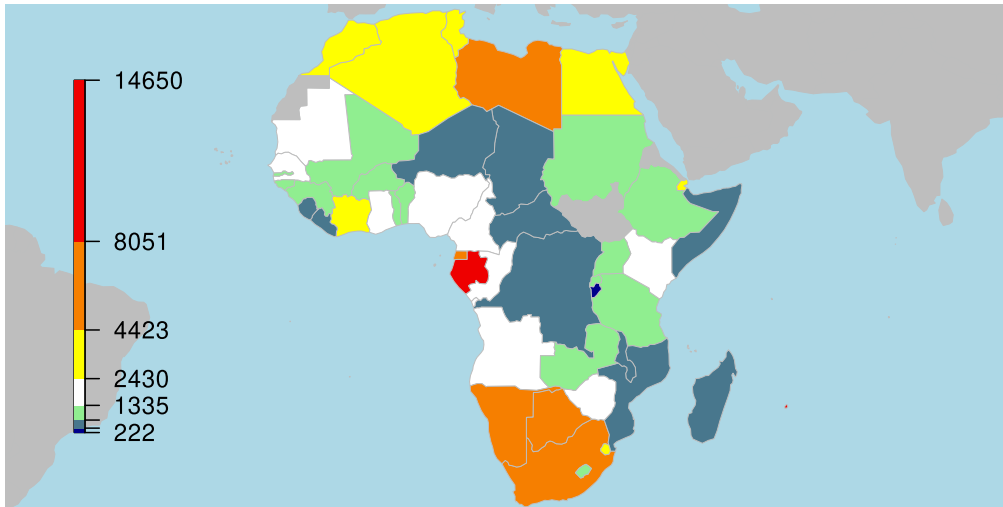- 2000-3000 languages
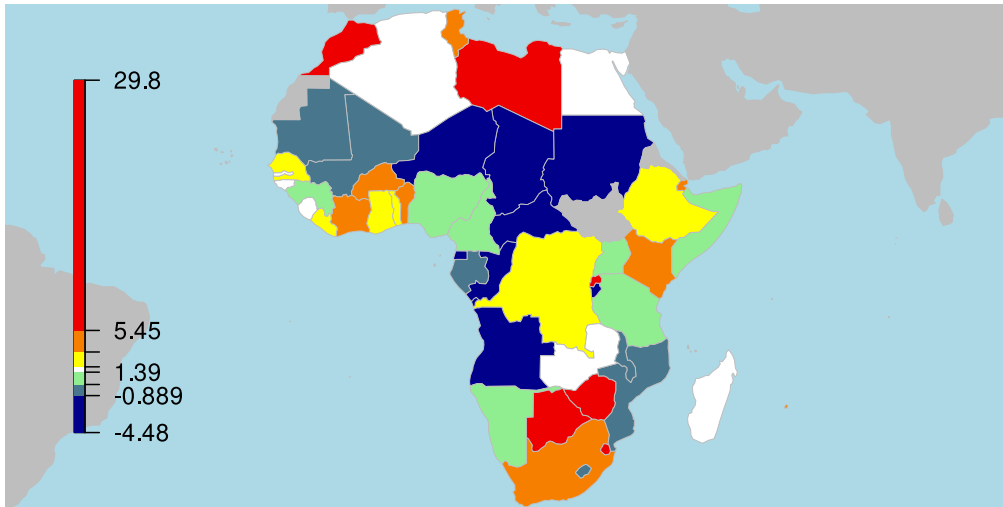 - Language Diversity Index [WLDI]

9. Per Capita Gross Domestic Product

- Per capita GDP 2021 in US$
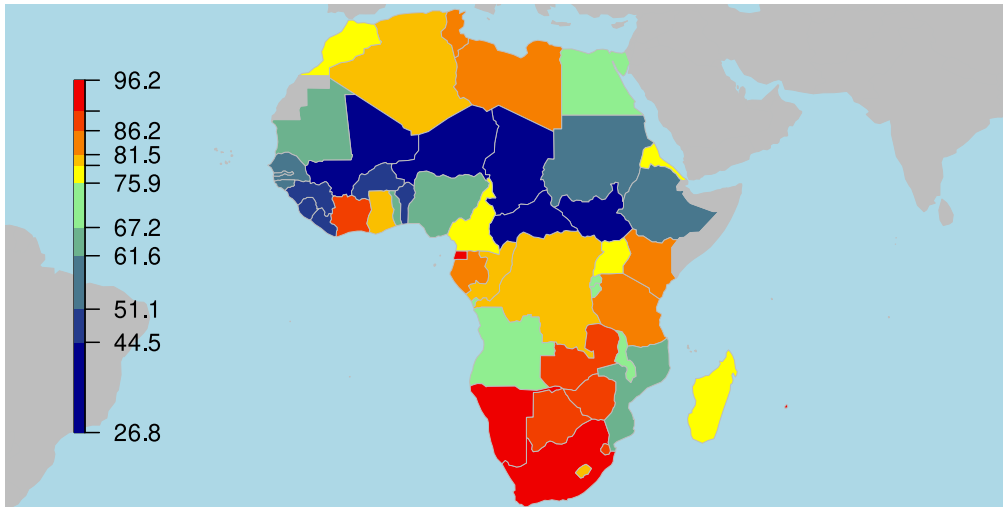
10. Per Capita Gross Domestic Product Growth Rate

- Per capita GDP growth rate in 2021
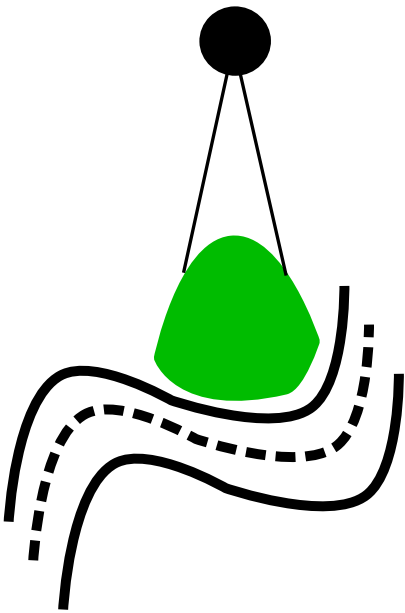
11. Education

- Adult literacy rate [WBLR]

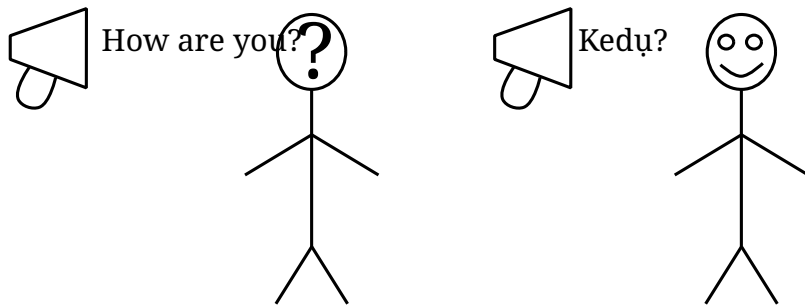# 12. Infrastructure

- Significant infrastructure investments
    - Roads
    - Telecommunications
- Some foreign investment to improve trade
    - Natural resource extraction
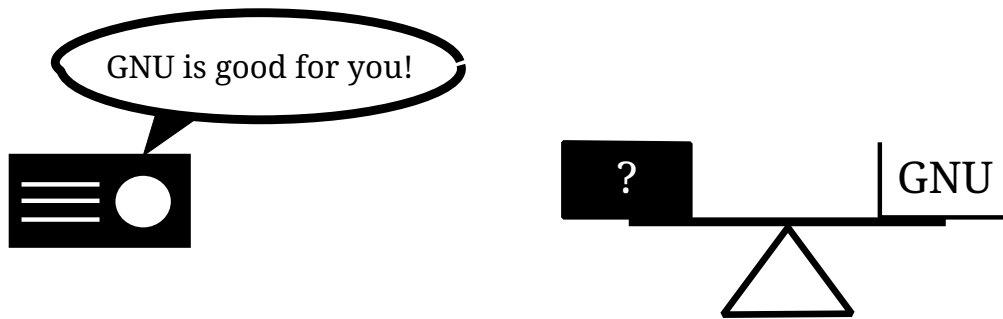   - Labor

13. Digitization Challenges

- Local needs secondary
  - Addressing local needs required for successful digitization
  - Succesful adaptation of radio for information dissemination
  - More needed for internet and computers
    - Due to costs, schools and internet cafes are first contact points
    - Smart phones are the secondary contact point

14. Challenges of Libre Software

- Poorly marketed

- Governance is often unclear

- Poor incorporation in legal and procurement systems

- Relatively high barriers to involvment when primary community is external
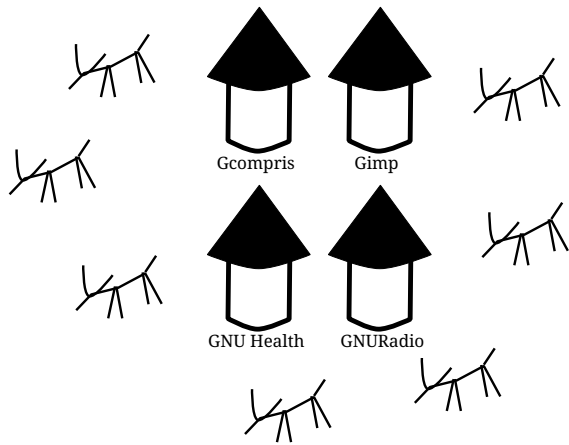
- Large time investment required to understand well

15. Opportunities Provided by Libre Software

- Auditable

- Easy to adapt and update

- Community driven learning

- Many packages that work well on limited hardware resources
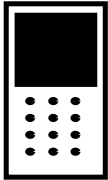
A GNU Village

16. Challenges of Mobile First

- Low memory and low performance devices

- Privacy is challenging

- Mindset is usually that of software consumer not co-creator

- Wide variety of device capabilities

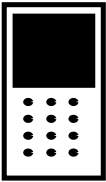- Technological ecosystem is designed elsewhere

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17. Opportunities of Mobile First

- Cloud can overcome some deficiencies
- Large potential user base
- Opportunity to develop new use cases - mobile money
- Can reuse old libre software designed for older computers

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18. Collecting Machine Learning Language Data

- English, French and Arabic are dominant official languages

- Many other languages primarily used orally

- A starting point is collecting a corpus suitable for early education

- Enable translation of commonly used terms

- Enable easy engagement

- Motivates an online short story competition

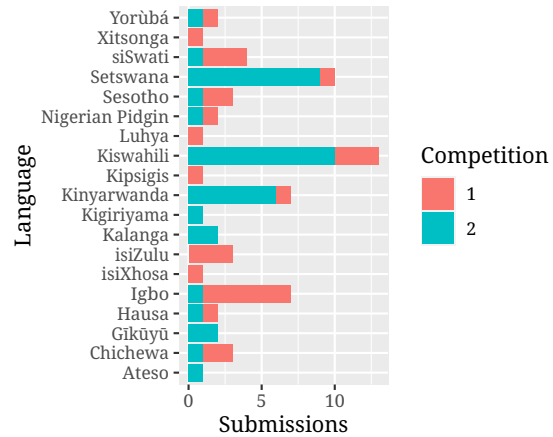# 19. Evaluating Machine Learning Language Data

- Language experts are few
- Community consensus for many languages is missing
- Use a voting system, if you submit you can rate
- Voting privacy and anonymity is challenging
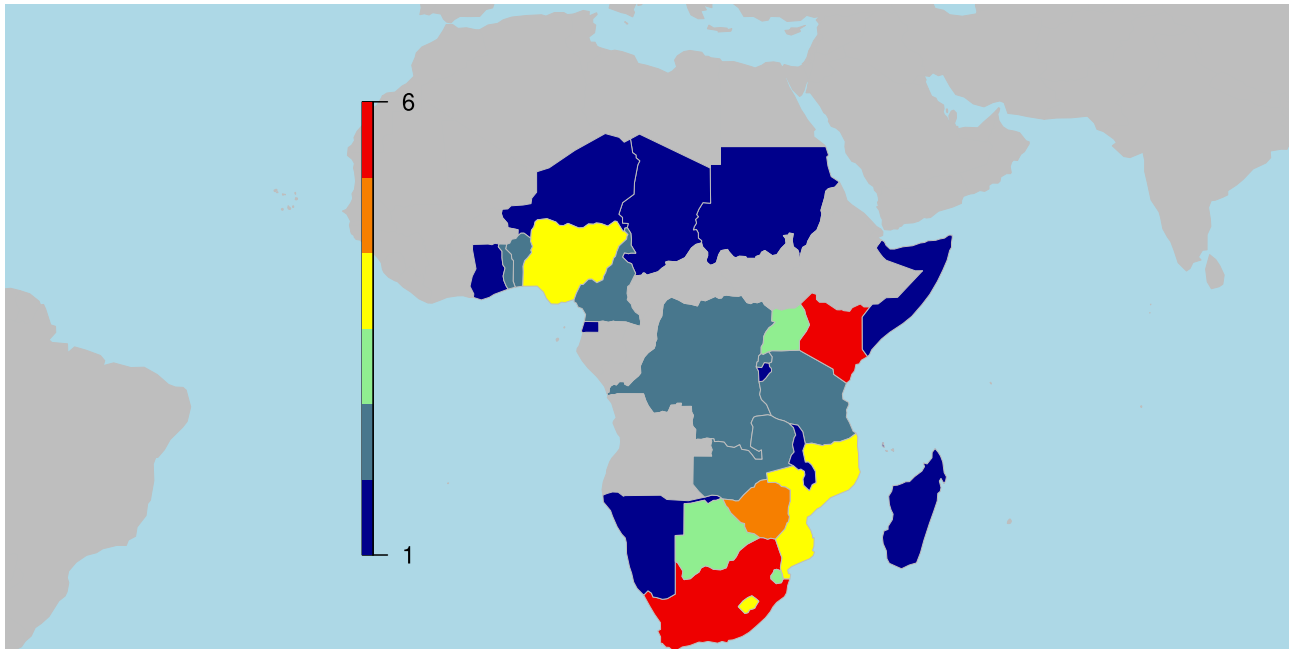
20. What Language Data Was Collected?

- Submissions by language for the competitions

21. Where can the Stories be Read?

- Countries where stories can be read

22. Using Machine Learning Language Data

- Language Learning Games
  - https://tuvutepamoja.africa/Igbo-Wordle/
  - https://tuvutepamoja.africa/Kinyarwanda-Wordle
  - https://tuvutepamoja.africa/Kiswahili-Wordle
  - https://tuvutepamoja.africa/Setswana-Wordle/

23. Relevant Libre Software

- Data collection platform https://tuvutapamoja.africa
  - Open source https://notabug.org/tuvutepamoja
  - Written in PHP
  - Easy to deploy on shared hosting
  - Soft keyboard to enable correct orthography
  - Minimize some of the privacy concerns
  - Hard to find libre shared hosting

24. Keyboards

- Easy customization possible today

- More difficult on typewriters

- Open source projects include

  - https://keyman.com

  - https://www.freedesktop.org/wiki/Software/XKeyboardConfig/

  - https://github.com/eyedol/kasahorow-Keyboard-For-Android

  - https://giellalt.github.io/

25. Summary

- Libre software can do well in Africa

- Largest challenges are mindset and regulation

- 𐑕𐑭𐑯𐑒𐑘𐑫 𐑩𐑕𐑨𐑯 Asante Daalụ Dankie Enkosi Godiya Kea leboha Mahadsanid Murakoze Ndatenda Ngiyabonga O ṣeun Zikomo

26. Acknowledgements

Bibliography

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- [WBLR] World Bank: Adult Literacy Rates
- [ITUFF19] ITU Facts and Figures 2019
- [ITUDH] ITU DataHub