Scientific Publications Mining with Awk and Swift

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SMOKY MOUNTAIN Computational Sciences and Engineering Conference | .:DATA:. CHALLENGE

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`github.com/ketancmaheshwari/SMC18`

Overview

- Data mining millions of scientific publication records
- Useful findings such as influential authors, geographic locations of research, citation networks, and topic trends
- Scalable computation by leveraging simplicity of classical linux tools and power of modern scalable workflow platform

Tools and Techniques

- **`jq`** to convert from **`json`** to tabular format
- **`Awk`** to perform core data crunching
- ANL's **`Swift`** to run awk in data-parallel setup
- Classic Linux tools for post processing: **`sort`**, **`sed`**, **`uniq`**, **`tr`**
- **`D3`**, **`graphviz`**, **`matplotlib`**, **`ffmpeg`** to visualize results

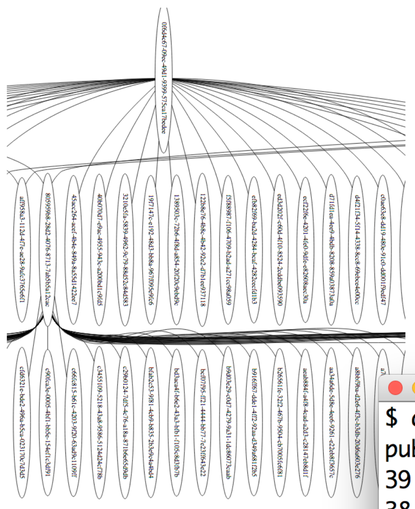
Data

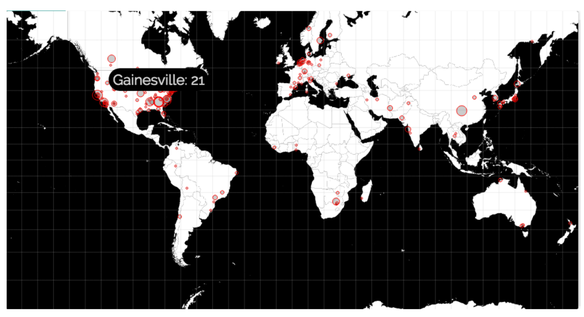
- **256 million** scientific publication records spread across 322 files
- Total data size is 329 GB, format is json
- Auxiliary data used: list of countries, cities, universities and a set of common words to filter from results

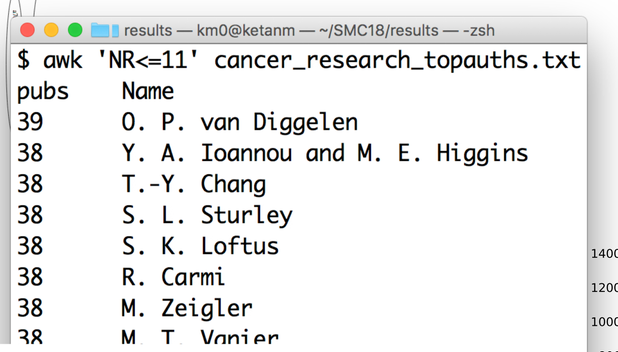
Benefits of using Awk+Swift

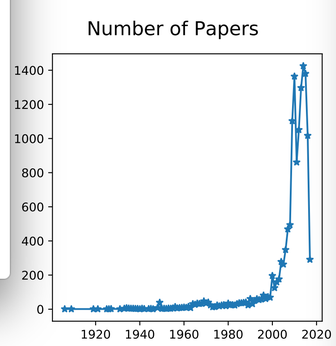
- Awk is highly suitable to text-processing portable to Linux systems
- Swift is portable to shared as well as distributed memory architectures
- Swift is known to work on leadership class supercomputers, eg. Summit

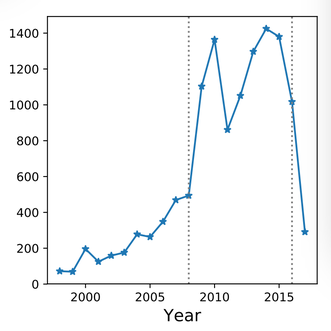
Results

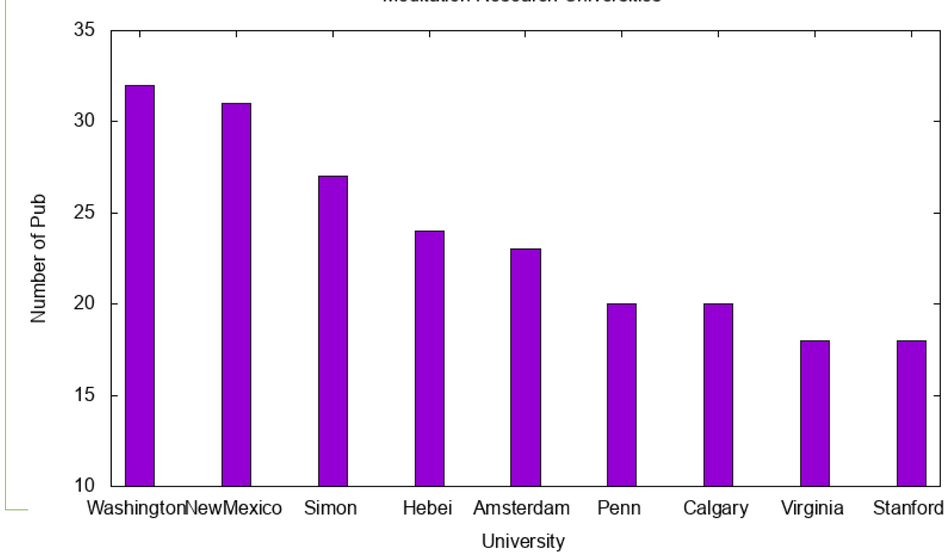


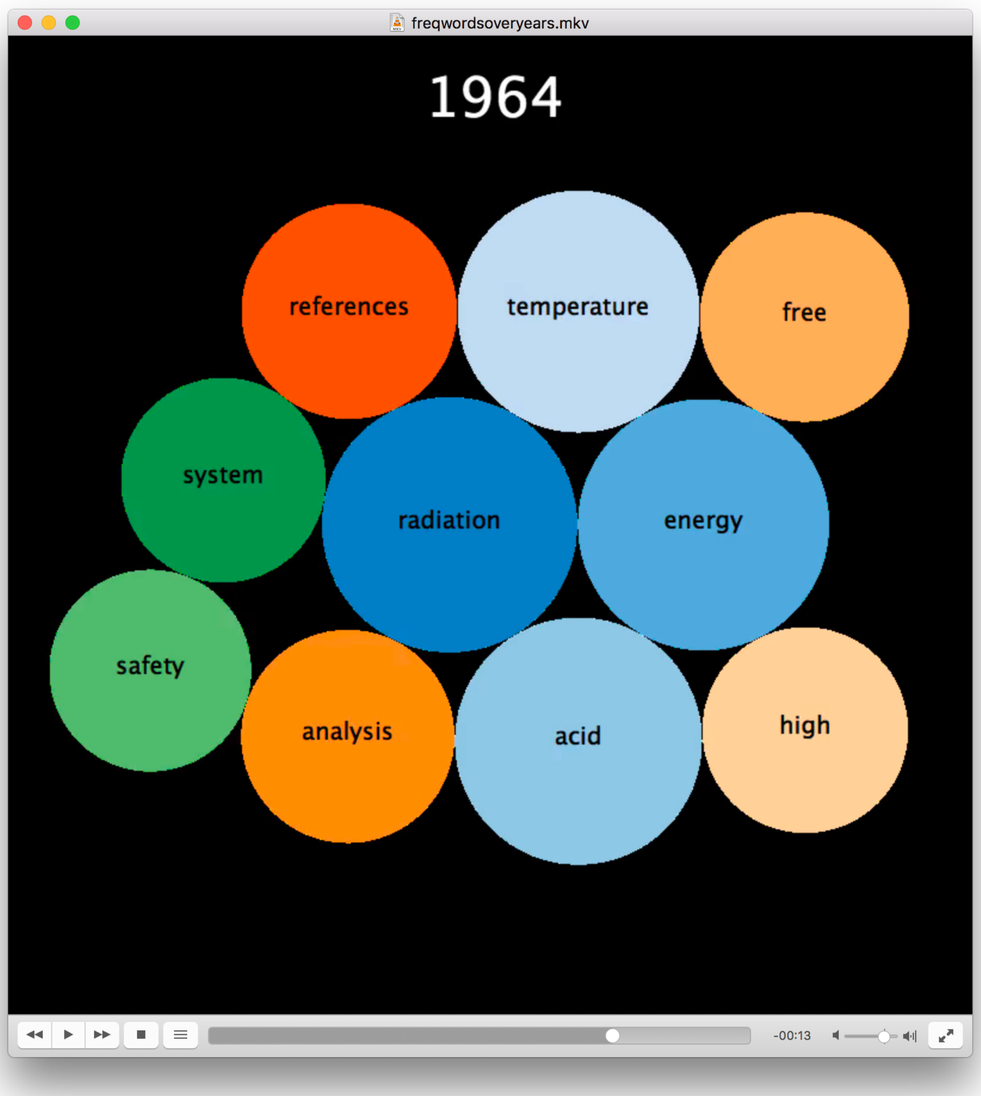












Performance

- Three out of five solutions takes **less than a minute** to finish
- Remaining two solutions takes less than an hour to finish
- Swift radically improves run time by concurrently running awk over **in-memory data** across the input

Bottomline

- Awk crunches massive amounts of data
- Swift parallelizes hundreds of awk calls
- In-memory computation for speedy runs
- Portable across legacy and modern architectures
- Scalable from laptop to leadership class systems

Acknowledgments

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