The value of open GIS in higher education.

Christina Hupy, Ph.D., Senior Education Program Manager GitLab

What is open source?

- Open source software is software where the source code is made available under a license that allows the modification, and re-distribution of the software at will. (opensource.org)

What is open source GIS?

- A system built on open source designed to capture, store, manipulate, manage, and present spatially referenced information.

Open Source GIS

- Desktop GIS
- Web GIS
- Database Systems
- Mobile GIS
- Open Community Mapping Effort

- OsGeo Foundation –
  - GeoNode, GRASS GIS, gvSIG, Marble, QGIS, FDO, GDAL/ORG, GEOS, GeoTools, OrfeoToolbox, OSSIM, PostGIS, GeoNetwork, degree, geomajas, GeoMOOSE, GeoServer, Mapbender, MapFish, MapGuide, MapServer, OpenLayers
- LocationTech
  - Geogig, Proj4J, geomesa, Spatial4j

Open Source GIS – Timeline

1978 - MOSS (Map Overlay and Statistical System)

1982 - GRASS GIS (Geographical Resources Analysis Support System)

1996 - GeoTools project started at the University of Leads

1998 - GDAL/OGR development started, Python support was added in 2000

2001 - PostGIS started; OSGeo incubation 2009-2012

2001 - GeoServer started by "The Open Planning Project“; OSGeo incubation 2009 - present

2002 - Quantum GIS initial revision in CVS

2004 - uDig was started by Refractions Research

2009 - OpenGeo Suite first released

2010 – GeoNode first released

Why bring open GIS into the classroom?

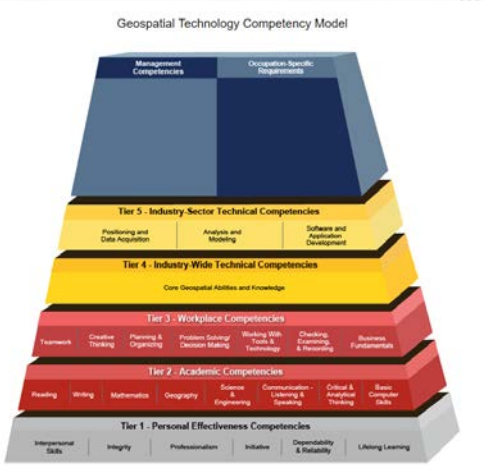
- Competencies
- Market demand
- Employer demand
- Generational interest
- Peer-reviewed benefits
- Role in emerging fields

Open source in geospatial competencies

Explicit

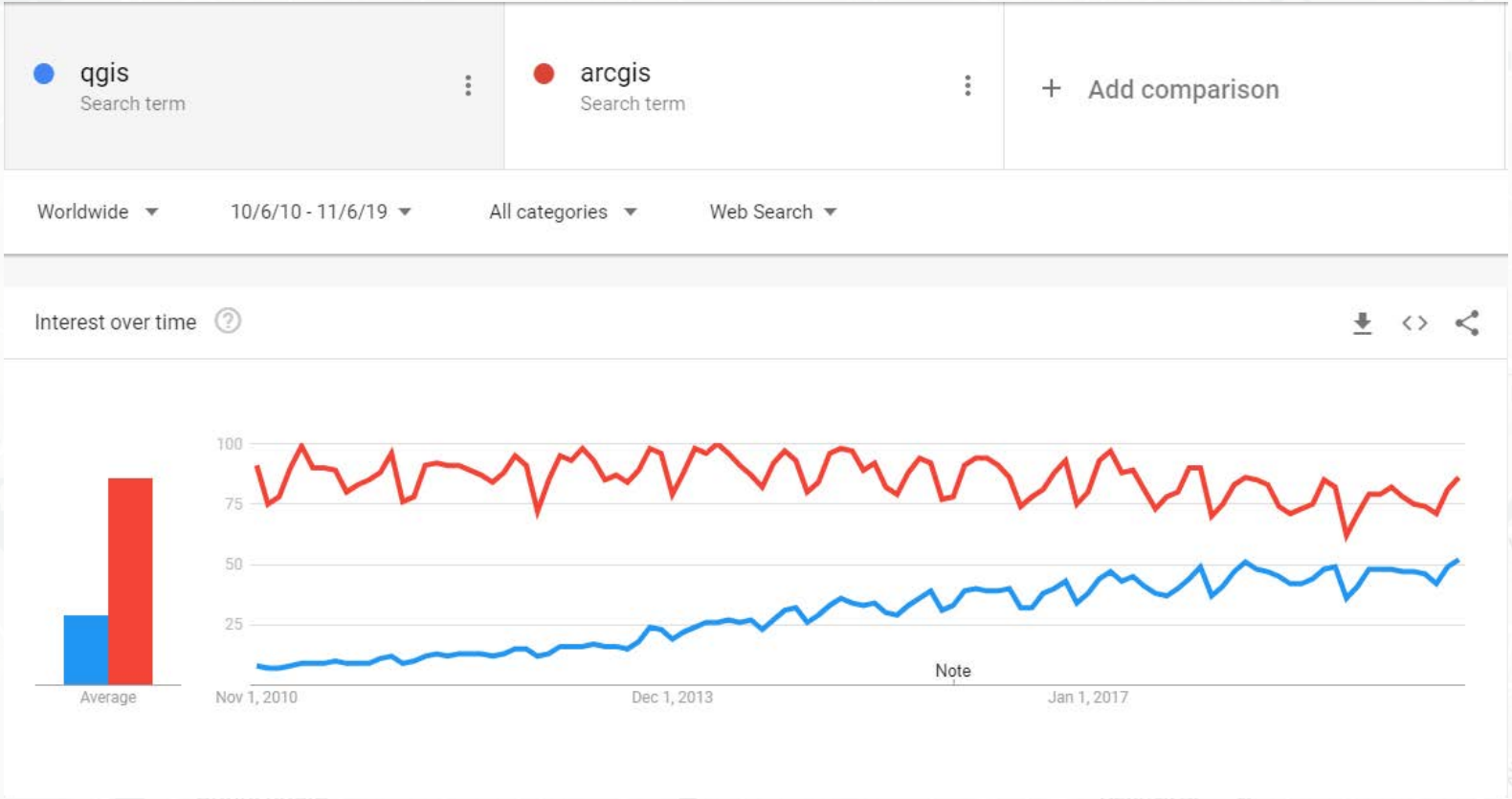
Implicit

Parallel



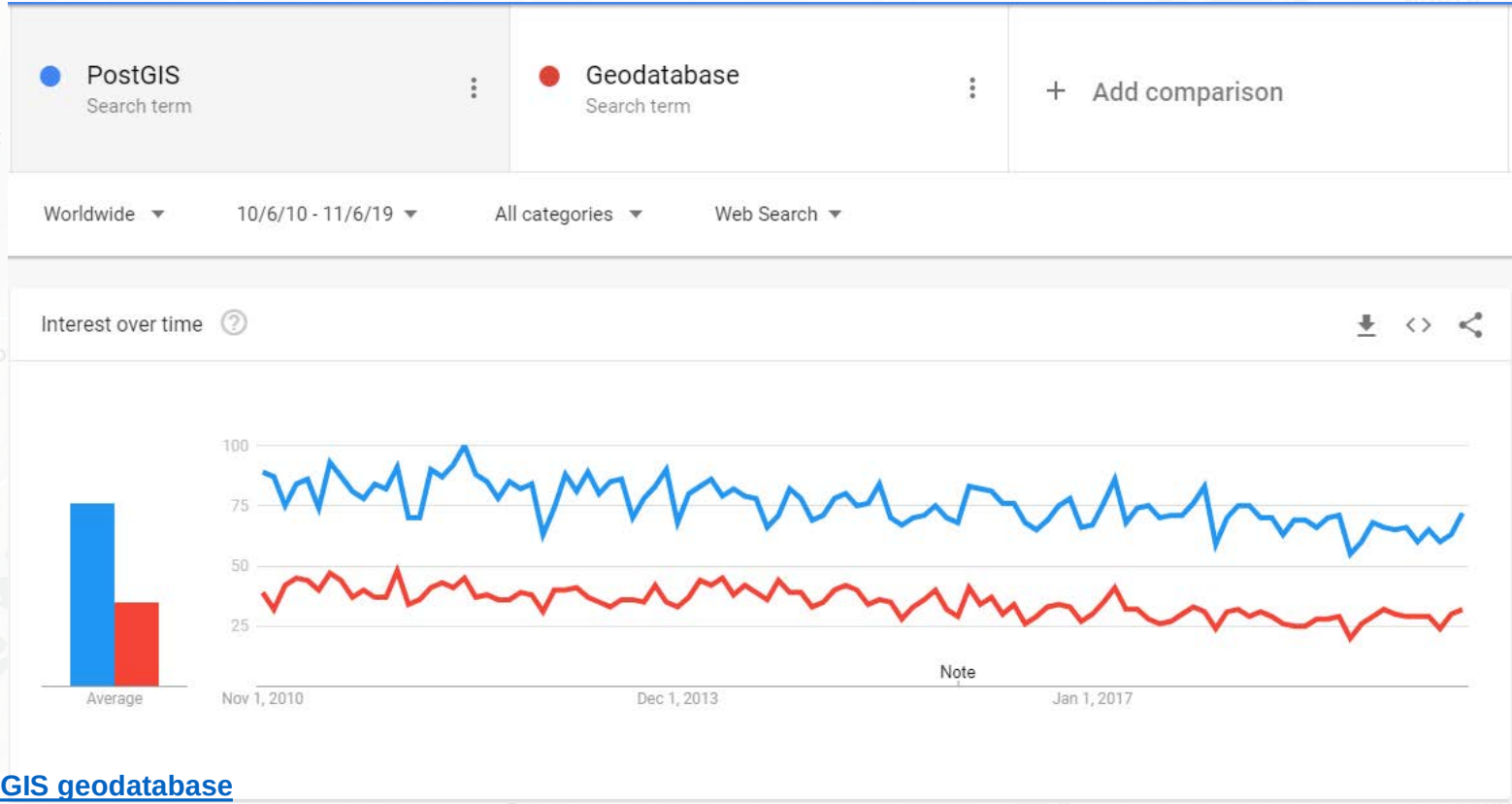

Demand?

Open Source Continues to grow



Source[Google Trends QGIS and ArcGIS]

Open Source Continues to Grow



Source: [Google Trends GIS geodatabase]

Employer Demand?

Site	Search Terms	No. Jobs
LinkedIn	GIS	10,741
Indeed	GIS	10,853
LinkedIn	GIS and Open source	389
Indeed	GIS and Open source	485
LinkedIn	GIS and Esri	2,223
Indeed	GIS and Esri	1,660
LinkedIn	QGIS	261
LinkedIn	GeoServer	193
LinkedIn	PostgreSQL	11,107
LinkedIn	PostGIS	223
LinkedIn	Geodatabase	389
LinkedIn	Open Source	35,124

Searches conducted on November 6, 2019

Employer Demand

29 SURPRISING FACTS THAT EXPLAIN

WHY MILLENNIALS SEE THE WORLD DIFFERENTLY

MILLENNIALS ARE NOW THE SINGLE LARGEST GROUP WITHIN THE WORK FORCE, AND WILL SOON BECOME THE BIGGEST CONSUMER GROUP, TOO. UNDERSTANDING, AND BEING ABLE TO ENGAGE WITH, MILLENNIALS IS GOING TO DETERMINE HOW SUCCESSFUL YOUR BUSINESS WILL BE.

1. Millennials are carrying a total of **$1 trillion** in student debt.

2. Over **63%** of Gen-Y workers have a bachelor's degree.

3. **48%** of employed college graduates work in jobs that don't require a four-year degree.

4. **45%** believe a decent paying job is a "privilege," not a "right."

5. **64%** of Millennials would rather make $40,000 a year at a job they love than $100,000 a year at a job they think is boring.

6. **88%** prefer a collaborative work culture rather than a competitive one.

9. **92%** believe that business success should be measured by more than just profit.

10. **40%** of Millennials think that blogging about workplace issues is acceptable, compared to 28 percent of Boomers.

18. **35%** of employed Millennials have started their own business on the side to supplement their income.

21. **84%** say that helping to make a positive difference in the world is more important than professional recognition.

22. They're more loyal to employers than previous generations.

23. The top ideal employers of currently employed Millennials are Google, Apple, Facebook, the U.S. State Department, and Disney.

24. **41%** of Millennials have no landline at home and rely on their cell phones for communication.

25. Millennials value community, family, and creativity in their work.

26. Millennials are not just virtually connected via social networks; they value the role that they play in these communities.

Millennials more open to open source

Millennials are also strong proponents of the use of open source technologies: 87 percent believe it is important for them to work for an organization that allows them to use open source technologies. But they aren't so far apart from their non-millennial peers on that front: 81 percent of Gen X and boomer respondents felt the same way.

Part of that mindset is about the desire for flexibility and creative liberties in the way they do their work. IT organizations tend to be strongly process-oriented, but 88 percent of millennials across all markets say their organization's current IT policies and procedures don't allow them to be as creative as they could be at work. And 90 percent of millennials say frequently using their own approach is faster than their organization's preferred approach. At the extreme end, 33 percent of millennials say their approach is faster "all the time" compared with 29 percent of non-millennials.

Millennials and the Next Generation of IT Perceptions and Influences on the Road to Public Cloud September 2016 Research: 2,500 IT Professionals surveyed across US, UK, Brazil, Japan and India

Benefits?

Peer-reviewed research

“By ensuring that students learn to distinguish between geospatial concepts and software specifics, students become more flexible and stronger spatial thinkers when choosing solutions for their independent work in the future….

By understanding the concepts and their implementation, students will become better scientists, who are able to generate, reproduce, critique and improve research and analysis.” ISPRS Int. J. Geo-Inf. 2015, 4 953

GTCM

Tier	Critical Work Functions	USGIF
Software and Application Development	Ensure that software code complies with industry standards, such as those promulgated by the Open Geospatial Consortium (OGC)	N
	Customize geospatial software using proprietary and open source software components, such as ESRI's ArcObjects, Intergraph's GeoMedia software suite, and the GeoTools open source project	N
	Evaluate open source software components for re-use and potential return contributions	N

GIS&T – Body of Knowledge

Knowledge Area	Unit	USGIF
Cartography and Visualization	CV5-1 Map Production	Y
Design Aspects	DA3-2 Resource Planning	N
Data Modeling	DM4-7 Object-based spatial databases	Y
Geocomputation	GC6-5 Agent-based modeling	N
Geospatial Data	GD12-5 Transport Protocols	N

Knowledge Area	Unit	USGIF
GIS&T and Society	GS4-2 Mechanisms of Control of geospatial information	N
	GS5-4 Balancing security and open access	N
Organizational and Institutional Aspects	OI5-5 Openness	Y
	OI6-1 Coordinating Organizations	Y

USGIF – EBK

Competency	Unit	
GIS & Analysis Tools	Open Source Geospatial Data	Sources and Types of Open-Source Geospatial Data (e.g., non-structured data)
		Geospatial Crowdsourcing (e.g., volunteered geographic information, “participatory sensing”)
		Common Capabilities and Limitations of Open-Source Geospatial Data (e.g., opensource versus proprietary data, data quality)
		Open-Source Geospatial Standards
		Sources of Open-Source Geospatial Error
		Open-Source “Spoofing”