

## GEOSTAT Bergen 2014 <sup>[1]</sup>

The **GEOSTAT Bergen 2014 Summer School** is 9th in a series of summer schools organized by R and OS GIS developers and enthusiasts. GEOSTAT aims at PhD students and R-sig-geo enthusiasts in a range of environmental and GIS sciences, with a special focus on analyzing spatio-temporal gridded data in R and connected OS GIS software.

*The registrations for this event are closed. Rankings are available [here](#) <sup>[2]</sup>.*

Period: **15 June (Sunday) to 22 June (Sunday) 2014**

*Connected event:*

[DailyMeteo.org/2014/Banner](http://DailyMeteo.org/2014/Banner) <sup>[3]</sup>

The participants will learn how to import and organize **space-time data i.e. time series of points, lines and rasters** and how to program statistical and geographical analysis using a combination of R and OS GIS functionality.

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### Lecturers / topics



<sup>[4]</sup>

**Roger Bivand** <sup>[4]</sup>: Representing and handling spatial and spatio-temporal data in R



<sup>[5]</sup>

**Robert Hijmans** <sup>[5]</sup>: Spatial modeling with environmental data (raster and dismo packages)



<sup>[6]</sup>

**Edzer Pebesma** <sup>[6]</sup>: Spatial and spatio-temporal statistics with R: an introduction



<sup>[7]</sup>

**Barry Rowlingson** <sup>[7]</sup>: Geospatial data in Python, QGIS and R



[8]

**Tomislav Hengl** [8]: plotKML tutorial (visualization of spatial and spatio-temporal data from R to Google Earth)



[9]

**Markus Metz** [9]: GRASS GIS 7 tutorial / update



[10]

**Benedikt Gräler** [10]: Spatio-temporal geostatistics: choosing and fitting models, interpolation (gstat tutorial)

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### *General topics of interest.*

- New software packages / new functionality for spatio-temporal data (R and OSGeo)
- Working with raster stacks (raster package)
- Data formats (classes) and methods for spatio-temporal data (sp, spacetime packages)
- Reading and writing spatial and spatio-temporal data (rgdal, sp, spacetime packages)
- Overlay, aggregate, summarize and subset operations with spatio-temporal data
- Round table on parallel computing: challenges and opportunities
- Combining geographical and statistical computing (R + GRASS GIS, R + SAGA GIS, R + QGIS)
- Application of R+OSGeo tools in: spatio-temporal monitoring, geostatistical mapping, point pattern analysis, epidemiology...
- Visualization of spatio-temporal data (plotKML, rasterVis)

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## Target audience

PhD students and researchers working with spatial and spatio-temporal data. Interest groups: [R Spatial](#) [11], [R Spatio-temporal](#) [12], [GRASS GIS](#) [13], [SAGA GIS](#) [14].

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## Venue

The school will be hosted at the [Norges Handelshøyskole \(NHH\)](#) [15] the **Norwegian School of Economics in Bergen** Norway. The course will benefit from streaming facilities in NHH's new building, as all sessions are streamed free worldwide, and subsequently made [available](#) [16]. The participants will be hosted in the two workshop rooms (labs 1 and 2) with 30-40 seats and 2 x 80 seat lecture theatres (auditoriums B and C) with built-in streaming. Please note that there are no parking places for participants' cars on campus; there are plenty of places for bicycles.



[17]

Auditorium B (C)



[17]

Lab B

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## Your computer

The summer school does not provide computers, so you should bring your own laptop computer. Power points are available for all lecture room seats (*European standard earthed socket* <sup>[18]</sup> - *please bring your own adapter if you need one*). Wifi is provided using Eduroam <sup>[19]</sup> and/or guest wifi with a 12-hour validity SMS password (can be repeated). We will be assuming that R 3.1.0 is used <sup>[20]</sup>. The programme sessions below will list the software <sup>[20]</sup> which should be pre-installed for each session (you may have much of it on your computer already). We will try to help with installation during computer practicals, but the more you have prepared before you arrive, the more time there will be for more interesting things.

If you use OSX Mavericks and need the rgdal and rgeos packages, please see Brian Ripley's post <sup>[21]</sup>. Note that downstream packages may not be available until binaries are built using the CRANxtras rgdal and rgeos binaries. (Until 12 May, it was not advisable to use the Mavericks build of R 3.1.0, as many geospatial software packages are not yet available for binary installation - see Brian Ripley's post <sup>[22]</sup>, and followup specifically on rgdal <sup>[23]</sup>; read other posts in the thread and read the May archives for updates).

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## Daily programme

([Download here](#) <sup>[24]</sup>)

Registration at NHH entrance A: **Sunday 15th June 16.00-19.00, Monday 16th June 8.00-9.00**; registration desk open during breaks or contact a local helper.

For Live broadcast options see: <http://geostat-course.org/Live> <sup>[25]</sup>

**DAY 1 - Monday, 16th June: Introduction to GEOSTAT** (all in auditorium C unless otherwise stated, streamed [here](#) <sup>[26]</sup>)

<i>time</i>	<i>topic</i>	<i>format</i>	<i>lecturer</i>
9.00-9.15	The official opening		
9.15-10.00	Welcome note and course overview ( <b><u>introduction to GEOSTAT</u></b> <sup>[27]</sup> )	lecture	T. Hengl
10.00-10.30	<b>Representing and handling spatial and spatio-temporal data in R</b> ( <a href="#">slides</a> <sup>[28]</sup> , <a href="#">script+data</a> <sup>[29]</sup> , <a href="#">installPackages</a> <sup>[30]</sup> , <a href="#">package_list</a> <sup>[31]</sup> )	lecture	R. Bivand
10.30-11.00	Coffee break		
11.00-12.10	<b>Representing and handling spatial and spatio-temporal data in R</b> (continued)	lecture	R. Bivand
12.10-12.30	<i>Spatio-temporal data, R and the Institute of Marine Research, Bergen</i>	presentation	G. O. Johansen
12.30-13.30	Lunch		
13.30-15.00	<b>Spatial modeling with environmental data</b>	lecture	R. Hijmans
15.00-15.30	Coffee break		

15.30-17.00	<b>Geospatial Python</b>	lecture	B. Rowlingson
17.00-18.00	Snack		
18:00-20:00	<b>Lab 1: <u>Crash course in R</u></b> <sup>[32]</sup> (optional) / <b>Lab 2: Crash course in Python</b>	computer practical	T. Hengl B. Rowlingson

## DAY 2 - Tuesday, 17th June:

<i>time</i>	<i>workshop A</i> <i>(auditorium C streamed <a href="#">here</a> <sup>[26]</sup> and Lab 1)</i>	<i>workshop B</i> <i>(auditorium B streamed <a href="#">here</a> <sup>[33]</sup> and Lab 2)</i>	<i>format</i>
9.00 - 10.30	Robert Hijmans: <b><u>Spatial modeling with environmental data</u></b> <sup>[34]</sup>	Tom Hengl: <b><u>Geocomputing with R + SAGA GIS</u></b> <sup>[35]</sup>	lecture
10.30 - 11.00	Coffee break		
11.00 - 12.30	Robert Hijmans: <b><u>Spatial modeling with environmental data</u></b> <sup>[34]</sup>	Tom Hengl: <b><u>Geocomputing with R + SAGA GIS</u></b> <sup>[35]</sup>	computer practical
12.30 - 13.30	Lunch		
13.30 - 15.00	Robert Hijmans: <b><u>Spatial modeling with environmental data</u></b> <sup>[34]</sup>	Tom Hengl: <b><u>Geocomputing with R + SAGA GIS</u></b> <sup>[35]</sup>	lecture
15.00 - 15.30	Coffee break		

15.30 - 17.00	Robert Hijmans: <b><u>Spatial modeling with environmental data</u></b> <sup>[34]</sup>	Tom Hengl: <b><u>Geocomputing with R + SAGA GIS</u></b> <sup>[35]</sup>	computer practical
17.00-17.45	Snack		
17:45-19.00	<b>Round table on parallel computing</b> - lecturers in Bergen and Jonathan Greenberg (by wire)		

### DAY 3 - Wednesday, 18th June:

<i>time</i>	<i>workshop A</i> ( <i>auditorium C streamed <a href="#">here</a></i> <sup>[26]</sup> <i>and Lab 1)</i>	<i>workshop B</i> ( <i>auditorium B streamed <a href="#">here</a></i> <sup>[33]</sup> <i>and Lab 2)</i>	<i>format</i>
9.00 - 10.30	Edzer Pebesma: <b><u>Spatial and spatio-temporal statistics with R: an introduction</u></b> <sup>[36]</sup>	Markus Metz: <b><u>GRASS GIS 7 tutorial / update</u></b> <sup>[37]</sup>	lecture
10.30 - 11.00	Coffee break		
11.00 - 12.30	Edzer Pebesma: <b><u>Spatial and spatio-temporal statistics with R: an introduction</u></b> <sup>[36]</sup>	Markus Metz: <b><u>GRASS GIS 7 tutorial / update</u></b> <sup>[37]</sup>	computer practical
12.30 - 13.30	Lunch		
13.30 - 15.00	Edzer Pebesma: <b><u>Spatial and spatio-temporal statistics with R: an introduction</u></b> <sup>[36]</sup>	Markus Metz: <b><u>GRASS GIS 7 tutorial / update</u></b> <sup>[37]</sup>	lecture
15.00 - 15.30	Coffee break		

15.30 - 17.00	Edzer Pebesma: <b><u>Spatial and spatio-temporal statistics with R: an introduction</u></b> <sup>[36]</sup>	Markus Metz: <b><u>GRASS GIS 7 tutorial / update</u></b> <sup>[37]</sup>	computer practical
19:30	<b><i>Gala dinner</i></b> (Zafran, <sup>[38]</sup> <u>Nygårdsgaten 53, 5008 Bergen</u> <sup>[38]</sup> )		

**DAY 4 - Thursday, 19th June:**

<i>time</i>	<i>workshop A</i> <i>(auditorium B streamed <u>here</u> <sup>[33]</sup> and Lab 1)</i>	<i>workshop B</i> <i>(auditorium C streamed <u>here</u> <sup>[26]</sup> and Lab 2)</i>	<i>format</i>
9.00 - 10.30	Barry Rowlingson: <b><u>Geospatial data in Python, QGIS and R</u></b> <sup>[39]</sup>	Ben Gräler: <b><u>Spatio-temporal geostatistics: choosing and fitting models, interpolation (gstat tutorial)</u></b> <sup>[40]</sup>	lecture
10.30 - 11.00	Coffee break		
11.00 - 12.30	Barry Rowlingson: <b><u>Geospatial data in Python, QGIS and R</u></b> <sup>[39]</sup>	Ben Gräler: <b><u>Spatio-temporal geostatistics: choosing and fitting models, interpolation (gstat tutorial)</u></b> <sup>[40]</sup>	computer practical
12.30 - 13.30	Lunch		
13.30 - 15.00	Tom Hengl: <b><u>visualization of spatial and spatio-temporal data from R to Google Earth</u></b> <sup>[41]</sup>	Ben Gräler: <b><u>Spatio-temporal geostatistics: choosing and fitting models, interpolation (gstat tutorial)</u></b> <sup>[40]</sup>	lecture
15.00 - 15.30	Coffee break		

15.30 - 16.45	Tom Hengl: <u>visualization of spatial and spatio-temporal data from R to Google Earth</u> <sup>[41]</sup>	Ben Gräler: <u>Spatio-temporal geostatistics: choosing and fitting models, interpolation (gstat tutorial)</u> <sup>[40]</sup>	computer practical
17.00-18.15	<b>Round table on visualisation</b> - lecturers in Bergen and Oscar Perpiñán Lamigueiro (by wire) - download zip archive from this <a href="#">link to slides</a> <sup>[42]</sup>		

### DAY 5 - Friday, 20th June: open day

<i>time</i>	<i>topic</i>	<i>format</i>	<i>lecturer</i>
9.00 - 10.30	<b>Sampling in space and in space-time</b>	lecture	T. Hengl R. Bivand
10.30 - 11.00	<i>Coffee break</i>		
11.00 - 12.30	<b>Some theory for spatial and spatio-temporal data</b>	lecture	S. Henrik Finne
12.30 - 13.30	Lunch		
13.30 - 15.30	<b>GRASS GIS raster / advanced functionality</b> <b>Importing and reprojecting MODIS images using gdalUtils</b>	lecture	M. Metz / T. Hengl
15.30 - 16.00	<i>Coffee break</i>		
16.00 - 17.00	Closing session and awards		

17.00 - 20.00 Orientation game

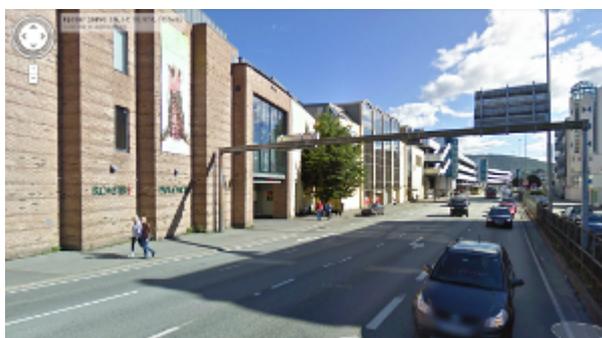
## DAY 6 - Saturday, 21st June: excursion

*time*

*moderator*

Excursion <sup>[43]</sup>: Starts at Bergen bus station (Blomsterpaviljongen, along the south west side on Fjøsangerveien)

9.00 - 18.30



F. Morency-Lavoie

We are going to Havråtun <sup>[44]</sup> and Lyngheisenter <sup>[45]</sup>.  
Traditional meal at Lyngheisenter.

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## Course fees

The course fee for this summer school is NOK 3300; this covers the actual costs, no profits are made. The organizers provide no funding/scholarships to participants, but accepted registered participants with a permanent residence and/or employer from the ODA listed countries <sup>[46]</sup> will be offered a subsidized course fee (the amount will be stated in the individual confirmation letter sent to each participant).

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## Arriving to Bergen

Bergen has a small but international airport with direct flights to some 50+ European destinations (see the complete list <sup>[47]</sup>). Participants can also fly to an Oslo airport (Gardermoen OSL, Rygge RYG, or Torp TRF), then take a train over Hardangervidda (takes about 7h).



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## Accommodation/Travel in Bergen

Please note that participants must book accommodation themselves, and it is advisable to book as soon as you can. Different options are available.

The course venue is at the [Norwegian School of Economics](#) [49], 4km north of the city centre. Access to the venue may be on foot, by cycle, or public transport. Buses to the venue come from the city centre, up to 20 per hour. Information about public transport is given by [Skys](#) [50], with tickets such as the [7-day ticket](#) [51] (NOK 215, about €26) being an attractive possibility permitting a wide range of accommodation options. If you are a registered student and under 32 years old, you must have a valid ISIC-card to qualify for the NOK 130 discounted rate. These tickets are valid for Bergen (1/2 zones). See the [OSM transport layer](#) [52] for more information about where public transport goes.

General information about accommodation in Bergen is available from [VisitBergen](#) [53].

## Sharing

For those who you would like to share rooms with other participants, you can meet on the [G+ Forum on the Geostat Community here](#) [54].

Our tips:

### A) Hotels

Lecturers will be staying at [Sandviken Brygge Hotel](#) <sup>[55]</sup>, the closest hotel to the venue ([map](#) <sup>[56]</sup>), walking distance. Please contact the hotel directly if you would like to stay there, saying that you are taking part in the Geostat 2014 course.

### ***B) Youth Hostels and low-cost hotels***

- [Bergen Vandrerhjem Montana](#) <sup>[57]</sup> ([map](#) <sup>[58]</sup>), bus 3 goes from near the YH to the course venue.
- [CityBox](#) <sup>[59]</sup>, Low-cost Hotel ([map](#) <sup>[60]</sup>, city centre)
- [Marken gjestehus](#) <sup>[61]</sup>, Guesthouse ([map](#) <sup>[62]</sup>, city centre)

There are others, including bed and breakfast, please search for availability at [VisitBergen](#) <sup>[53]</sup> or other sites.

### ***C) Private Apartments***

Participants attending intensive courses in Bergen often form small groups and jointly rent an apartment for a week. There are a number of websites giving information, such as:

- [AirBnB](#) <sup>[63]</sup>
- [Hybel.No](#) <sup>[64]</sup>
- [Finn.No](#) <sup>[65]</sup>

### ***D) Student housing***

We are in negotiation with the student association in Bergen (SiB) (the organization that manages student housing in Bergen). We may be able to obtain some available rooms but both whether this is possible, or how much it may cost, remain unclear. Please contact us if you are interested, but remember that it is possible that SiB will not provide any rooms, or rooms at a moderate rate.

[Here](#) <sup>[66]</sup> is some information about the kinds of rooms, but we believe that the minimum rental period is at least 3 weeks. The [Hatleberg](#) <sup>[67]</sup> location is very close to the course venue, the others involve using public transport. SiB may be an opportunity for participants planning to stay in Bergen for a longer period.

Please contact [Felix Morency-Lavoie](#) and/or [Roger Bivand](#) <sup>[68]</sup> if you need more information.

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## **Key dates**

- First call out: 18th January 2014
  - Registration deadline: [1st March 2014](#) <sup>[69]</sup>
  - Published rankings (invitation letters sent out): 18th March 2014
  - Expired deadline for registration fees: Wednesday 30 April
  - Deadline for delayed/waiting list registration fees: **Friday 23 May at 14.00 CEST**
  - Final program of the summer school: 25th May 2014
-

## Contacts

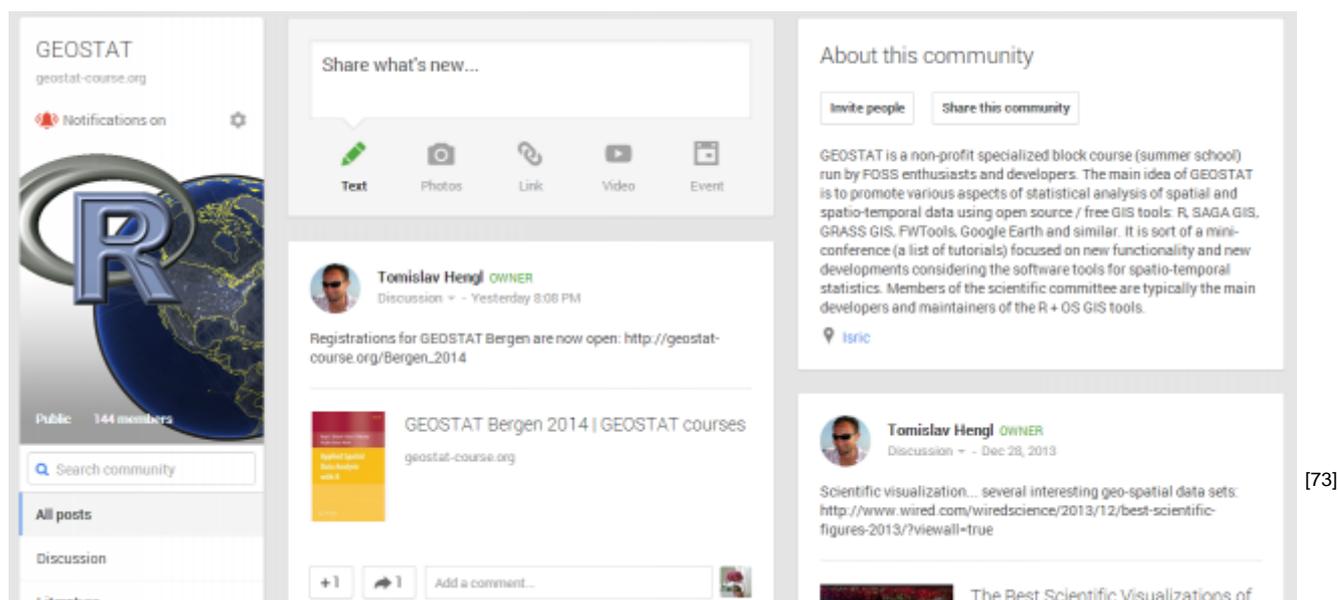
- T. (Tom) Hengl [70]: registrations, website materials
- R. (Roger) Bivand [71]: the official program, local organiser
- F. (Félix) Morency-Lavoie [72] local organiser, accommodation questions (links to other local organisers will be added shortly)

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## Live updates / support

For Live broadcast options see: <http://geostat-course.org/Live> [25]

Follow this event on **G+** [73]:



The screenshot shows the Google+ community page for GEOSTAT. The header includes the community name 'GEOSTAT' and the URL 'geostat-course.org'. A navigation bar offers options for Text, Photos, Link, Video, and Event. A post by Tomislav Hengl (OWNER) from yesterday at 8:08 PM announces that registrations for GEOSTAT Bergen are now open, with a link to 'http://geostat-course.org/Bergen\_2014'. Below this is a post titled 'GEOSTAT Bergen 2014 | GEOSTAT courses' from the same user. On the right, the 'About this community' section describes GEOSTAT as a non-profit specialized block course (summer school) run by FOSS enthusiasts and developers, focusing on promoting statistical analysis of spatial and spatio-temporal data using open source/free GIS tools like R, SAGA GIS, GRASS GIS, FWTools, and Google Earth. It also mentions a mini-conference focused on new functionality and developments. A 'Share this community' button is visible. At the bottom right, there is a link to 'The Best Scientific Visualizations of'.

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## Orientation game

On the last day of the summer school (Friday or Saturday) we will run an outdoor orientation game. Participants will be split in groups and will be asked to follow instructions and navigate in an area and fulfill the tasks (typically combination of general knowledge and spatial calculus).

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## Spatial prediction competition game

At each GEOSTAT, a spatial prediction game is organized in which the participants try to solve a spatial prediction problem and produce an analytical solution (see an example [74]). The spatial prediction competition has been inspired by the Spatial Interpolation Comparison [75] exercises. The best performing method / competitor is awarded at the end of the summer school (the award for the best performing idea is usually an Amazon gift card for books).

- The Spatial prediction competition game 2014 [76]

The deadline to submit predictions is **Friday 20th of June exactly at 16:00 Central European Time**

(just after the coffee break).

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**Source URL:** <https://geostat-course.org/content/geostat-bergen-2014>

### Links

- [1] <https://geostat-course.org/content/geostat-bergen-2014>
- [2] [http://geostat-course.org/Rankings\\_Bergen\\_2014](http://geostat-course.org/Rankings_Bergen_2014)
- [3] <http://dailymeteo.org/2014>
- [4] <http://www.nhh.no/Default.aspx?ID=697>
- [5] [http://www.des.ucdavis.edu/FacultyInfo.aspx?ID\\_Number=83](http://www.des.ucdavis.edu/FacultyInfo.aspx?ID_Number=83)
- [6] <http://ifgi.uni-muenster.de/staff/edzer-pebesma>
- [7] <http://geospaced.blogspot.com>
- [8] <http://www.wageningenur.nl/en/Persons/dr.-T-Tom-Hengl.htm>
- [9] <http://gis.cri.fmach.it/metz/>
- [10] <http://ifgi.uni-muenster.de/graeler>
- [11] <http://cran.r-project.org/web/views/Spatial.html>
- [12] <http://cran.r-project.org/web/views/SpatioTemporal.html>
- [13] <http://grass.osgeo.org/>
- [14] <http://www.saga-gis.org/>
- [15] <http://goo.gl/maps/CYLpS>
- [16] <http://archive.org>
- [17] <http://geostat-course.org/image/tid/33>
- [18] [http://en.wikipedia.org/wiki/AC\\_power\\_plugs\\_and\\_sockets#CEE\\_7.2F4\\_.28German\\_.22Schuko.22.29.28Type\\_F.29](http://en.wikipedia.org/wiki/AC_power_plugs_and_sockets#CEE_7.2F4_.28German_.22Schuko.22.29.28Type_F.29)
- [19] <https://www.eduroam.org/>
- [20] <http://www.geostat-course.org/Software>
- [21] <https://stat.ethz.ch/pipermail/r-sig-mac/2014-May/010871.html>
- [22] <https://stat.ethz.ch/pipermail/r-sig-mac/2014-April/010835.html>
- [23] <https://stat.ethz.ch/pipermail/r-sig-mac/2014-April/010860.html>
- [24] [http://geostat-course.org/sites/default/files/calendar\\_2014-06-15\\_2014-06-22.pdf](http://geostat-course.org/sites/default/files/calendar_2014-06-15_2014-06-22.pdf)
- [25] <http://geostat-course.org/Live>
- [26] <http://spatial.nhh.no/misc/geostat14/streamingC.html>
- [27] <http://geostat-course.org/about>
- [28] [http://geostat-course.org/sites/default/files/geostat\\_talk\\_140616.pdf](http://geostat-course.org/sites/default/files/geostat_talk_140616.pdf)
- [29] <http://geostat-course.org/sites/default/files/geostat14.zip>
- [30] <http://geostat-course.org/sites/default/files/installPackages.R>
- [31] [http://geostat-course.org/sites/default/files/packages\\_0.txt](http://geostat-course.org/sites/default/files/packages_0.txt)
- [32] [http://www.geostat-course.org/Baby\\_steps\\_R](http://www.geostat-course.org/Baby_steps_R)
- [33] <http://spatial.nhh.no/misc/geostat14/streamingB.html>
- [34] <https://geostat-course.org/node/1234>
- [35] <https://geostat-course.org/node/1232>
- [36] <https://geostat-course.org/node/1235>
- [37] <https://geostat-course.org/node/1236>
- [38] <http://goo.gl/maps/xe2pV>
- [39] <https://geostat-course.org/node/1237>
- [40] <https://geostat-course.org/node/1233>
- [41] <https://geostat-course.org/node/1238>
- [42] <https://github.com/oscarperpinan/geostat2014>
- [43] <http://goo.gl/maps/cxzqZ>
- [44] <http://goo.gl/maps/pa9UP>
- [45] <http://goo.gl/maps/FGmKn>
- [46] <http://www.oecd.org/dac/stats/daclist>
- [47] <http://www.avinor.no/en/airport/bergen>
- [48] <http://www.avinor.no/en/airport/bergen/timetables>
- [49] <http://goo.gl/maps/87Qzb>
- [50] <https://www.skyss.no/nn-NO/GlobalToppMeny1/English/>

[51] <https://www.skyss.no/nn-NO/GlobalToppMeny1/English/Travelcard-and-prices1/Tickets/Periodic-Travel---7-30-or-180-days/>

[52] <http://osm.org/go/0Rv0DYm?layers=T>

[53] <http://www.visitbergen.com/en/where-to-stay/>

[54] <https://plus.google.com/u/0/communities/105596643004484799784>

[55] [http://www.sbhotel.no/default\\_e.asp?](http://www.sbhotel.no/default_e.asp?)

[56] <http://goo.gl/maps/NZGq8>

[57] <http://www.montana.no/en/>

[58] <http://goo.gl/maps/OtFNM>

[59] <http://citybox.no/?lang=en&loc=Bergen>

[60] <http://goo.gl/maps/4BRet>

[61] <http://marken-gjestehus.com/home>

[62] <http://goo.gl/maps/VEKgt>

[63] <https://www.airbnb.com/?locale=en>

[64] <http://hybel.no/>

[65] <http://www.finn.no/finn/realestate/lettings/result?areald=20220>

[66] <http://www.boligtorget.no/sib/Housing/Predefined/Single>

[67] <http://goo.gl/maps/IIIAG>

[68] <mailto:Felix.Morency-Lavoie@stud.nhh.no;Roger.Bivand@nhh.no?subject=Accommodation%20GEOSTAT%20Bergen>

[69] [http://geostat-course.org/Register\\_for\\_Bergen](http://geostat-course.org/Register_for_Bergen)

[70] <mailto:tom.hengl@wur.nl?subject=GEOSTAT%20Bergen%202014>

[71] <mailto:roger.bivand@nhh.no?subject=GEOSTAT%20Bergen%202014>

[72] <mailto:Felix.Morency-Lavoie@stud.nhh.no?subject=GEOSTAT%20Bergen%202014>

[73] <https://plus.google.com/communities/103560544243938791437>

[74] <http://geostat-course.org/node/1133>

[75] [http://www.ai-geostats.org/pub/AI\\_GEOSTATS/AI\\_GEOSTATSData/SIC97\\_description\\_01.pdf](http://www.ai-geostats.org/pub/AI_GEOSTATS/AI_GEOSTATSData/SIC97_description_01.pdf)

[76] <https://geostat-course.org/node/1244>