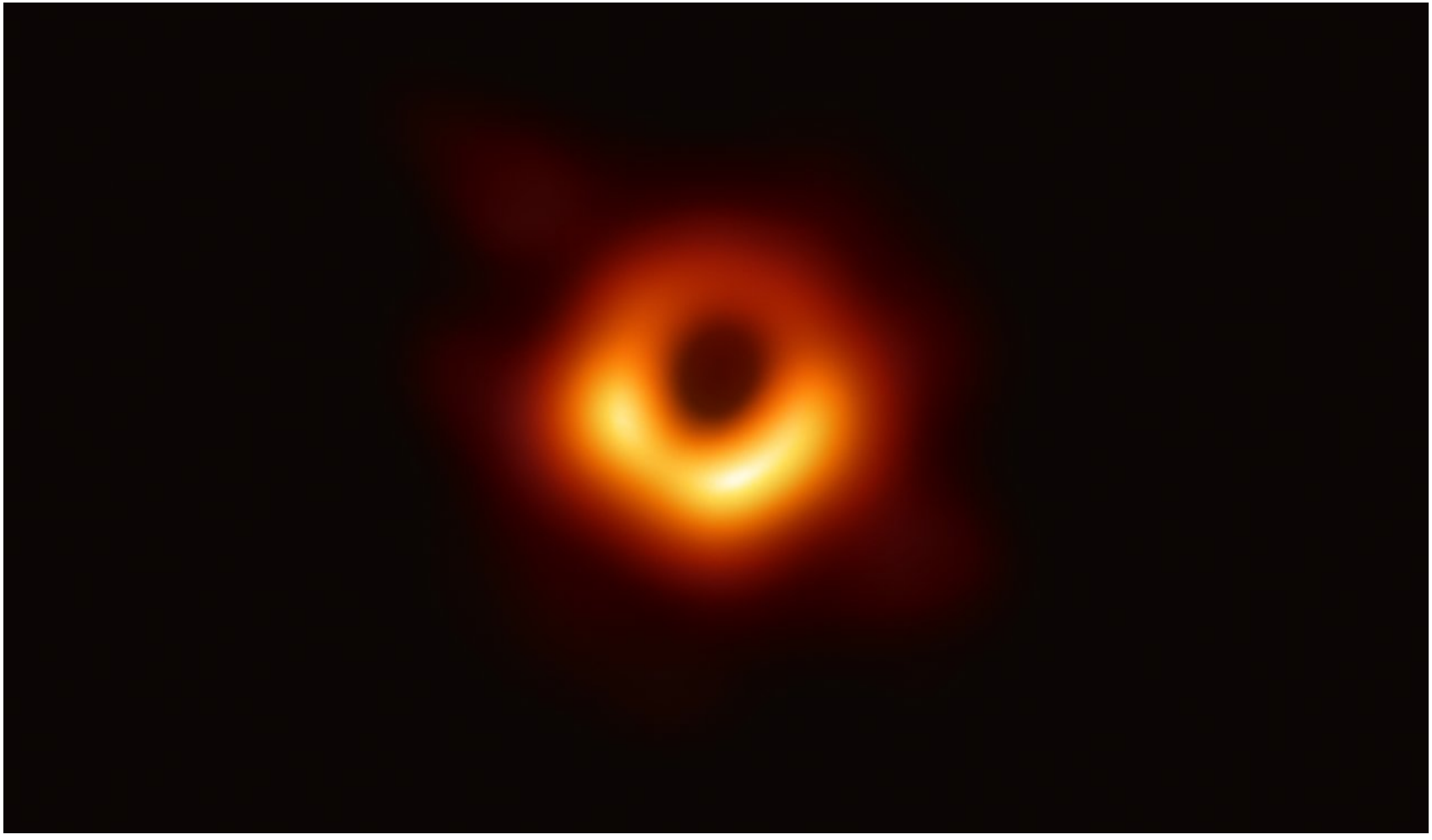
Introduction to SciPy

Gert-Ludwig Ingold

https://github.com/gertingold/euroscipy-scipy-tutorial.git

Event Horizon Telescope

supermassive black hole in M87



credit: EHT Collaboration

Event Horizon Telescope

The Astrophysical Journal Letters, 875:L3 (32pp), 2019 April 10 https://doi.org/10.3847/2041-8213/ab0c57

First M87 Event Horizon Telescope Results. III. Data Processing and Calibration

The Event Horizon Telescope Collaboration
(See the end matter for the full list of authors.)
Received 2019 February 11; revised 2019 March 3; accepted 2019 March 3; published 2019 April 10

Abstract

We present the calibration and reduction of Event Horizon Telescope (EHT) 1.3 mm radio wavelength observations of the supermassive black hole candidate at the center of the radio galaxy M87 and the quasar 3C 279, taken during the 2017 April 5–11 observing campaign. These global very long baseline interferometric

W. Brisken for EHT-specific support with the use of DiFX. We acknowledge the significance that Maunakea, where the SMA and JCMT EHT stations are located, has for the indigenous Hawaiian people.

Facilities: EHT, ALMA, APEX, IRAM:30 m, JCMT, LMT, SMA, ARO:SMT, SPT.

Software: DiFX (Deller et al. 2011), CALC, PolConvert (Martí-Vidal et al. 2016), HOPS (Whitney et al. 2004), CASA (McMullin et al. 2007), AIPS (Greisen 2003), ParselTongue (Kettenis et al. 2006), GNU Parallel (Tange 2011), GILDAS, eht-imaging (Chael et al. 2016, 2018), Numpy (van der Walt et al. 2011), Scipy (Jones et al. 2001), Pandas (McKinney 2010), Astropy (The Astropy Collaboration et al. 2013, 2018), Jupyter (Kluyver et al. 2016), Matplotlib (Hunter 2007).

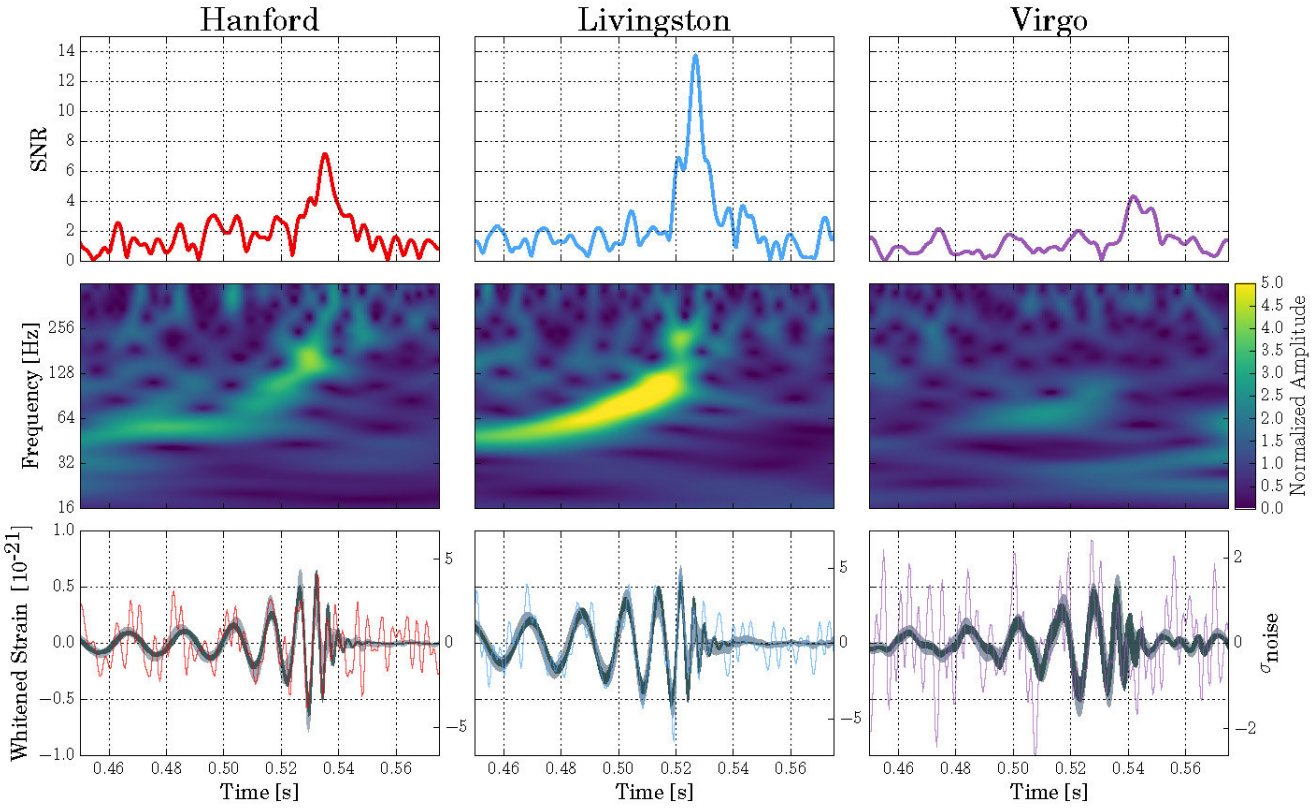
Appendix
Site and Data Issues

A.1. Issues Requiring Mitigation

The JCMT and SMA are located within hundreds of meters of each other on Maunakea. The small natural fringe rate is

☞ keynote on Thursday by Sara Issaoun

Gravitational waves



credit: LIGO/Caltech/MIT/LSC

☞ Leo Singer, SciPy 2018 keynote

Role of Python in Recent Gravitational Wave Astronomy Breakthroughs with LIGO and Virgo

`https://www.youtube.com/watch?v=PiZ0gxAiGuU`

Gravitational waves

PHYSICAL REVIEW D **93,** 122003 (2016)

GW150914: First results from the search for binary black hole coalescence with Advanced LIGO

B. P. Abbott *et al.*[*]
(LIGO Scientific Collaboration and Virgo Collaboration)
(Received 9 March 2016; published 7 June 2016)

On September 14, 2015, at 09:50:45 UTC the two detectors of the Laser Interferometer Gravitational-Wave Observatory (LIGO) simultaneously observed the binary black hole merger GW150914. We report the results of a matched-filter search using relativistic models of compact-object binaries that recovered

masses from 1 $M_\odot$ to 99 $M_\odot$, total mass less than 100 $M_\odot$ and dimensionless spins up to 0.99. The search was performed using two independently implemented analyses, referred to as PyCBC [3–5] and GstLAL [6–8]. These analyses use a common set of template waveforms [9–11], but differ in their implementations of matched filtering

```
Requires: lal >= @MIN_LAL_VERSION@
Requires: lalburst >= @MIN_LALBURST_VERSION@
Requires: lalmetaio >= @MIN_LALMETAIO_VERSION@
Requires: lalinspiral >= @MIN_LALINSPIRAL_VERSION@
Requires: lalsimulation >= @MIN_LALSIMULATION_VERSION@
Requires: numpy > @MIN_NUMPY_VERSION@
Requires: orc >= @MIN_ORC_VERSION@
Requires: python >= @MIN_PYTHON_VERSION@
Requires: python-%{gstreamername}
Requires: python-gobject >= @MIN_PYGOBJECT_VERSION@
Requires: python2-lal >= @MIN_LAL_VERSION@
Requires: python-ligo-lw >= @MIN_LIGO_LW_VERSION@
Requires: python2-ligo-segments >= @MIN_LIGO_SEGMENTS_VERSION@
Requires: scipy
Requires: zlib
BuildRequires: doxygen >= @MIN_DOXYGEN_VERSION@
```

gwastro / pycbc

<> Code | Issues 80 | Pull requests 23 | Projec

Branch: master ▾ pycbc / requirements.txt

sum33it Adding support for dynesty sampler. (#2832)

12 contributors

43 lines (38 sloc) | 1020 Bytes

```
1  # requirements for most basic library use
2  astropy>=2.0.3,<3.0.0; python_version <= '2.7'
3  astropy>=2.0.3; python_version >= '3.0'
4  Mako>=1.0.1
5  decorator>=3.4.2
6  scipy>=0.16.0; python_version >= '3.5'
7  scipy>=0.16.0,<1.3.0; python_version <= '3.4'
8  matplotlib>=2.0.0
9  numpy>=1.13.0,<1.15.3; python_version <= '2.7'
10 numpy>=1.13.0; python_version >= '3.0'
11 pillow
```

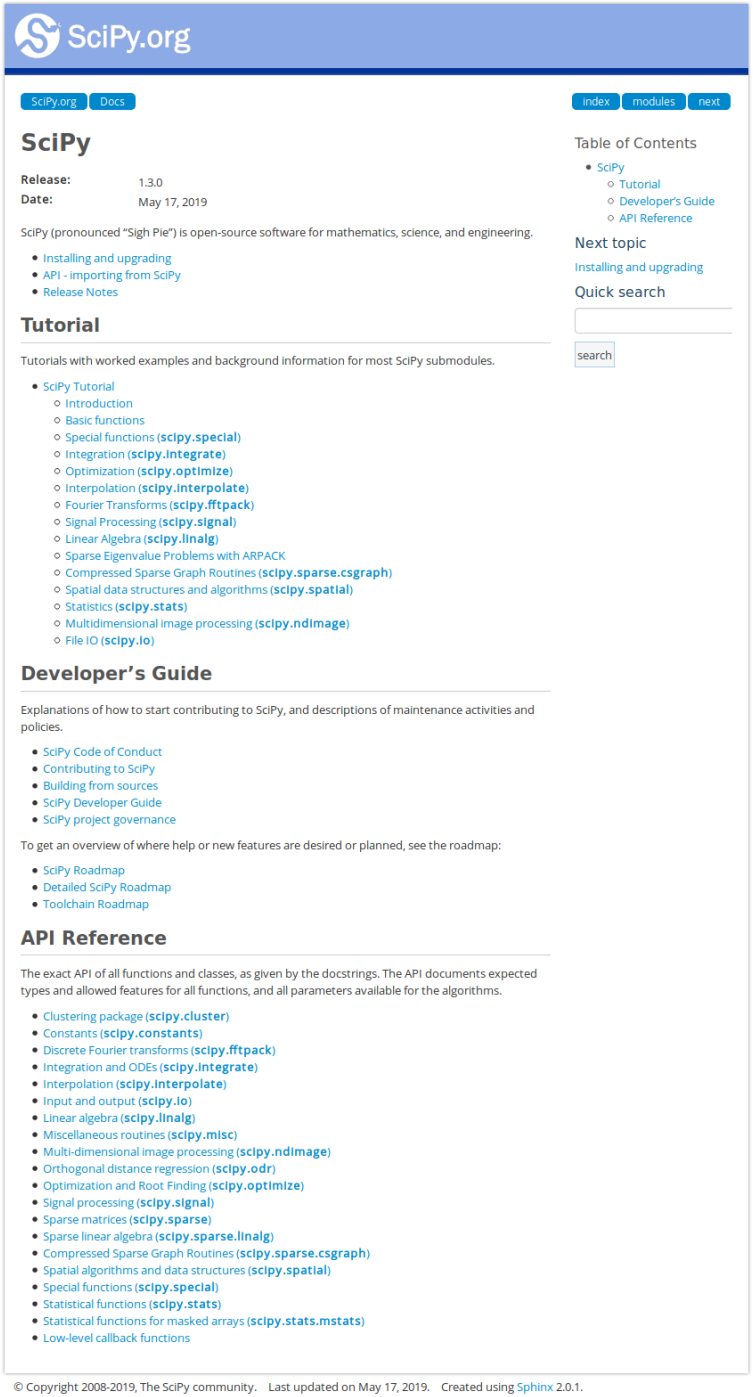
Tutorial on the scientific Python ecosystem

Gaël Varoquaux • Emmanuelle Gouillart • Olav Vahtras • Pierre de Buyl
Christopher Burns • Adrian Chauve • Robert Cimrman • Christophe Combelles
Ralf Gommers • André Espaze • Zbigniew Jędrzejewski-Szmek
Valentin Haenel • Gert-Ludwig Ingold • Fabian Pedregosa • Didrik Pinte
Nicolas P. Rougier • Joris Van den Bossche • Pauli Virtanen

and many others...

NumPy/SciPy Documentation

docs.scipy.org



A brief history of SciPy

SciPy 1.0—Fundamental Algorithms for Scientific Computing in Python

Pauli Virtanen[1], Ralf Gommers[2,*], Travis E. Oliphant[3,4,5,6,2], Matt Haberland[7,8,*], Tyler Reddy[9,*], David Cournapeau[10], Evgeni Burovski[11], Pearu Peterson[12,13], Warren Weckesser[10], Jonathan Bright[14], Stéfan J. van der Walt[15], Matthew Brett[16], Joshua Wilson[10], K. Jarrod Millman[15,17], Nikolay Mayorov[18], Andrew R. J. Nelson[19], Eric Jones[5], Robert Kern[5], Eric Larson[20], CJ Carey[21], İlhan Polat[10], Yu Feng[22], Eric W. Moore[23], Jake VanderPlas[24], Denis Laxalde[10], Josef Perktold[10], Robert Cimrman[25], Ian Henriksen[26], E. A. Quintero[10], Charles R Harris[10], Anne M. Archibald[27], Antônio H. Ribeiro[28], Fabian Pedregosa[29], Paul van Mulbregt[30], and SciPy 1.0 Contributors

https://arxiv.org/abs/1907.10121

NumPy/SciPy Documentation

`cluster`	clustering package
`constants`	constants
`fftpack`	discrete Fourier transforms
`integrate`	integration and ordinary differential equations
`interpolate`	interpolation
`io`	input and output
`linalg`	linear algebra
`misc`	miscellaneous routines
`ndimage`	multi-dimensional image processing
`odr`	orthogonal distance regression
`optimize`	optimization and root finding
`signal`	signal processing
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`spatial`	spatial algorithms and data structures
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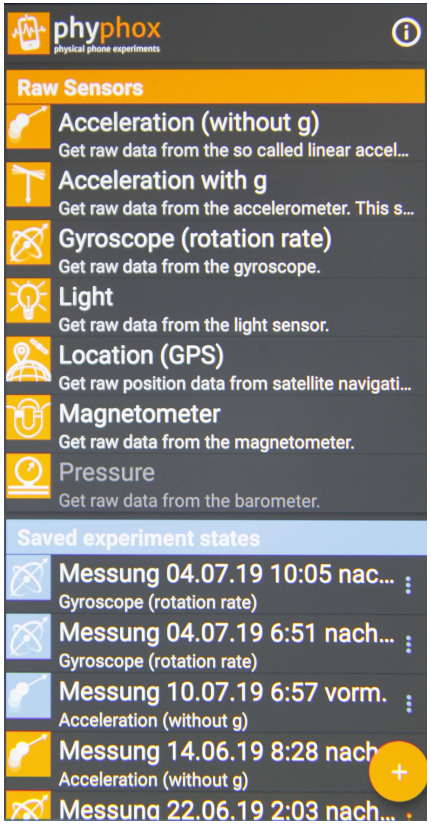
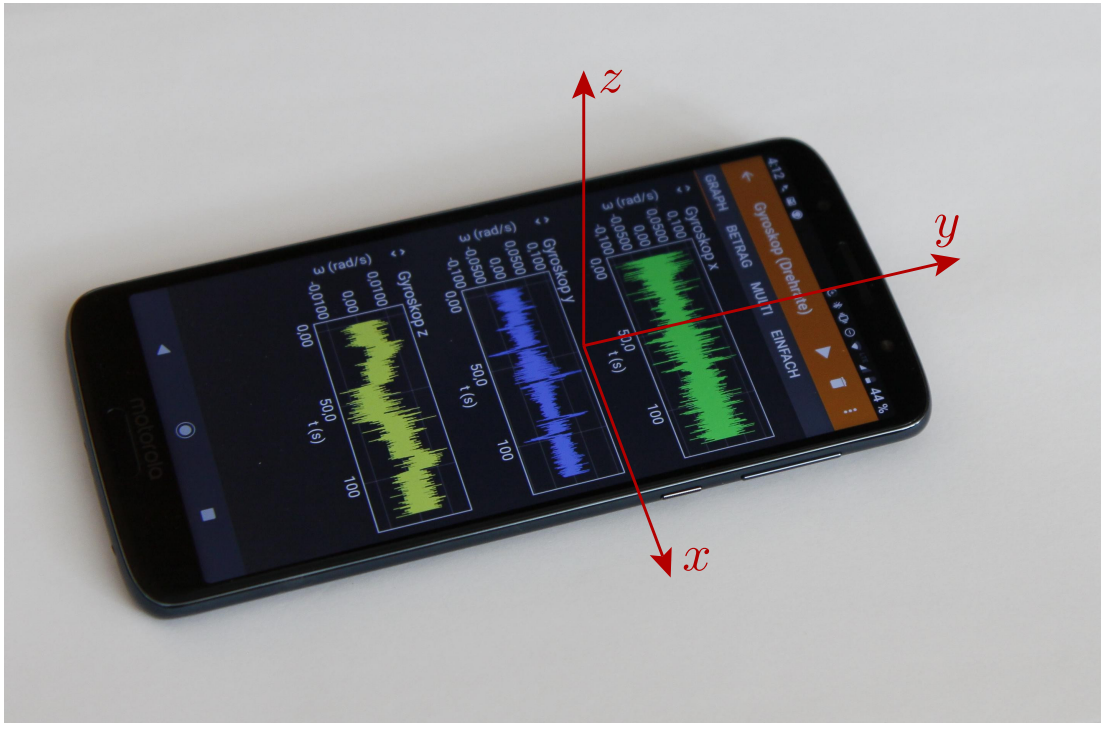
Taking data with the smartphone

phyphox
physical phone experiments

smartphone app developed by the
2nd Institute of Physics of the RWTH Aachen University

see phyphox.org for more information





TGV Duplex