fatiando a terra

Construindo uma base para ensino e pesquisa de geofísica

LEONARDO UIEDA

leouieda.com

histórico

2004

—

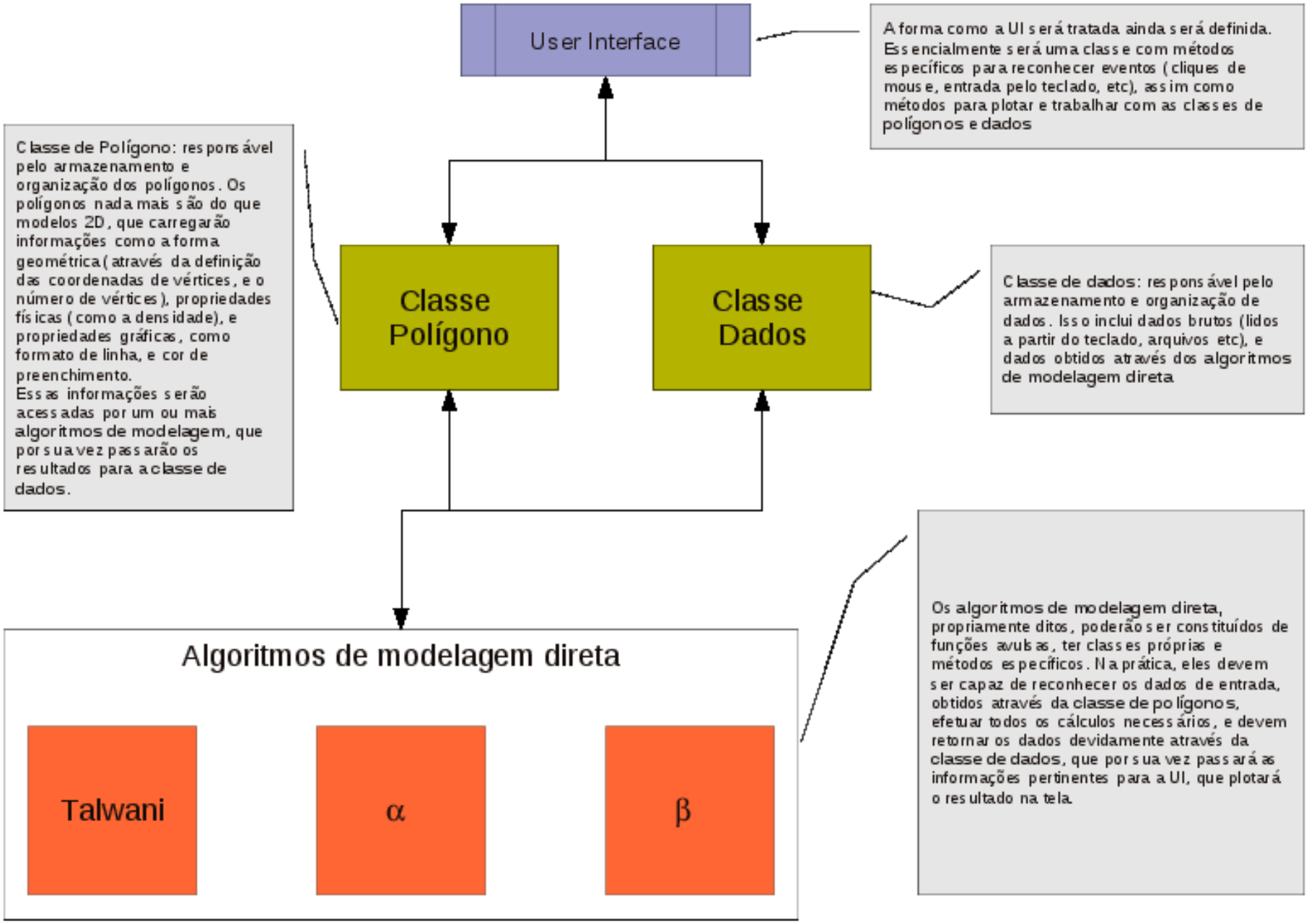
2009


IAG
graduação em geofísica

~2009 - projeto

modelagem direta

grav-mag


User Interface
A forma como a UI será tratada ainda será definida. Essencialmente será uma classe com métodos específicos para reconhecer eventos (cliques de mouse, entrada pelo teclado, etc), assim como métodos para plotar e trabalhar com as classes de polígonos e dados
Classe de Polígono: responsável pelo armazenamento e organização dos polígonos. Os polígonos nada mais são do que modelos 2D, que carregarão informações como a forma geométrica (através da definição das coordenadas de vértices, e o número de vértices), propriedades físicas (como a densidade), e propriedades gráficas, como formato de linha, e cor de preenchimento.
Essas informações serão acessadas por um ou mais algoritmos de modelagem, que por sua vez passarão os resultados para a classe de dados.
Classe Polígono
Classe Dados
Classe de dados: responsável pelo armazenamento e organização de dados. Isso inclui dados brutos (lidos a partir do teclado, arquivos etc), e dados obtidos através dos algoritmos de modelagem direta
Algoritmos de modelagem direta
Talwani
α
β
Os algoritmos de modelagem direta, propriamente ditos, poderão ser constituídos de funções avulsas, ter classes próprias e métodos específicos. Na prática, eles devem ser capaz de reconhecer os dados de entrada, obtidos através da classe de polígonos, efetuar todos os cálculos necessários, e devem retornar os dados devidamente através da classe de dados, que por sua vez passará as informações pertinentes para a UI, que plotará o resultado na tela.

2010

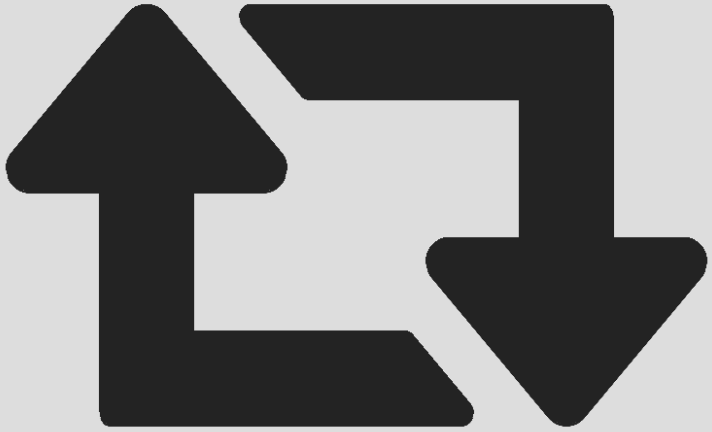

mestrado
observatório nacional
credit: Leandro Ciuffo

juntar código

matérias (inversão)

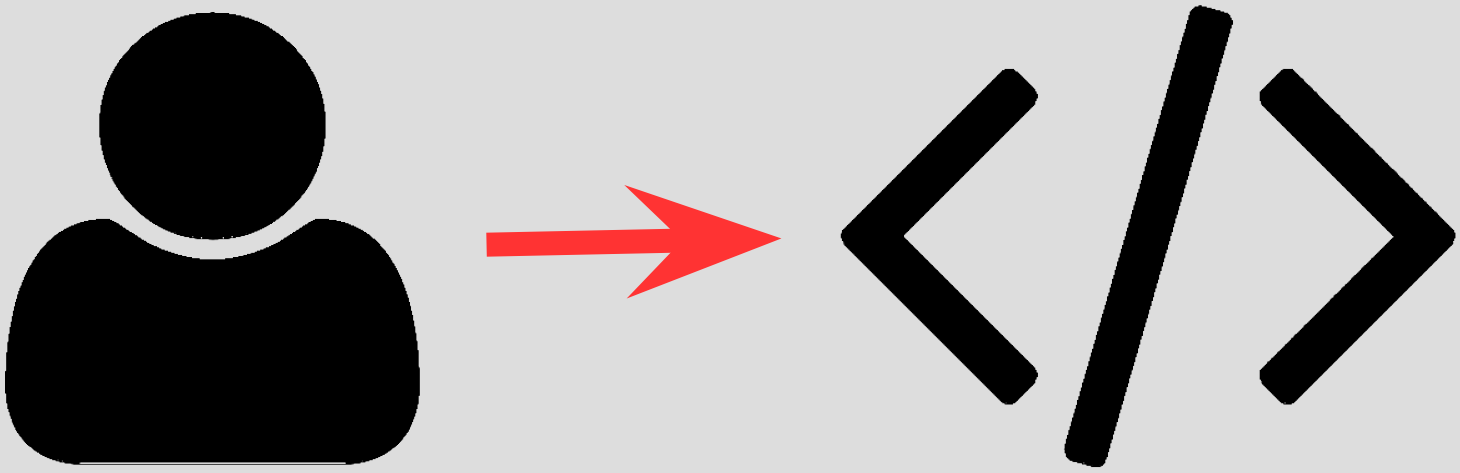
dissertação, extra

reutilizar



muita

re-implementação

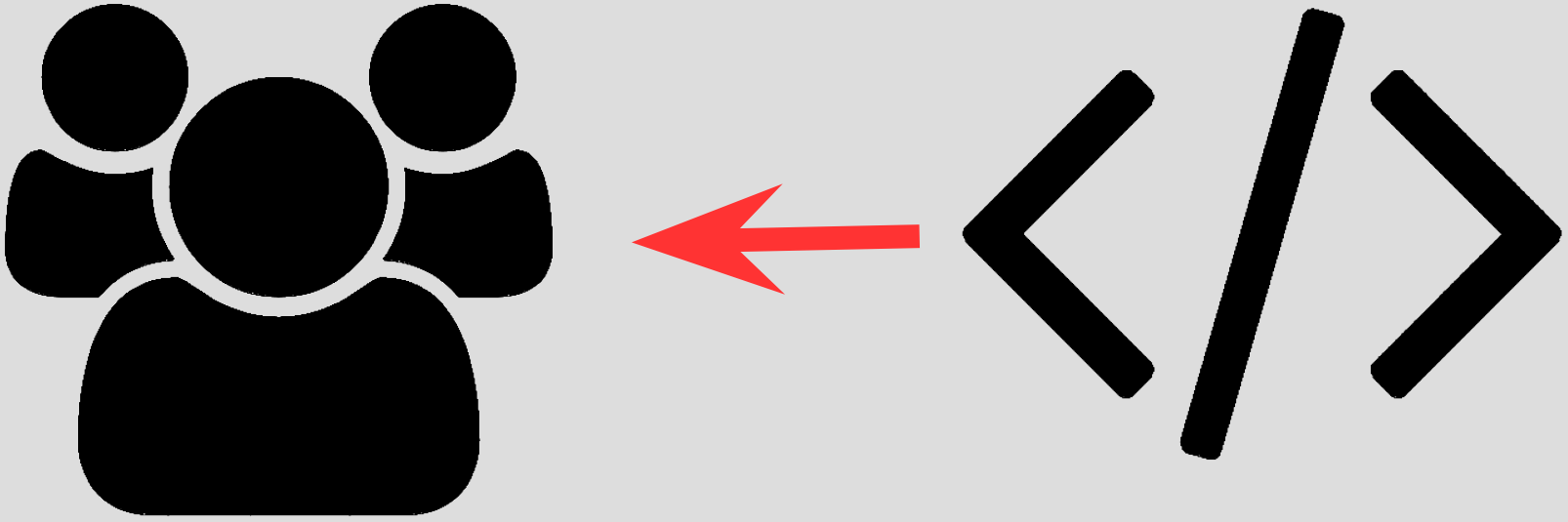


repetição

leva a erros

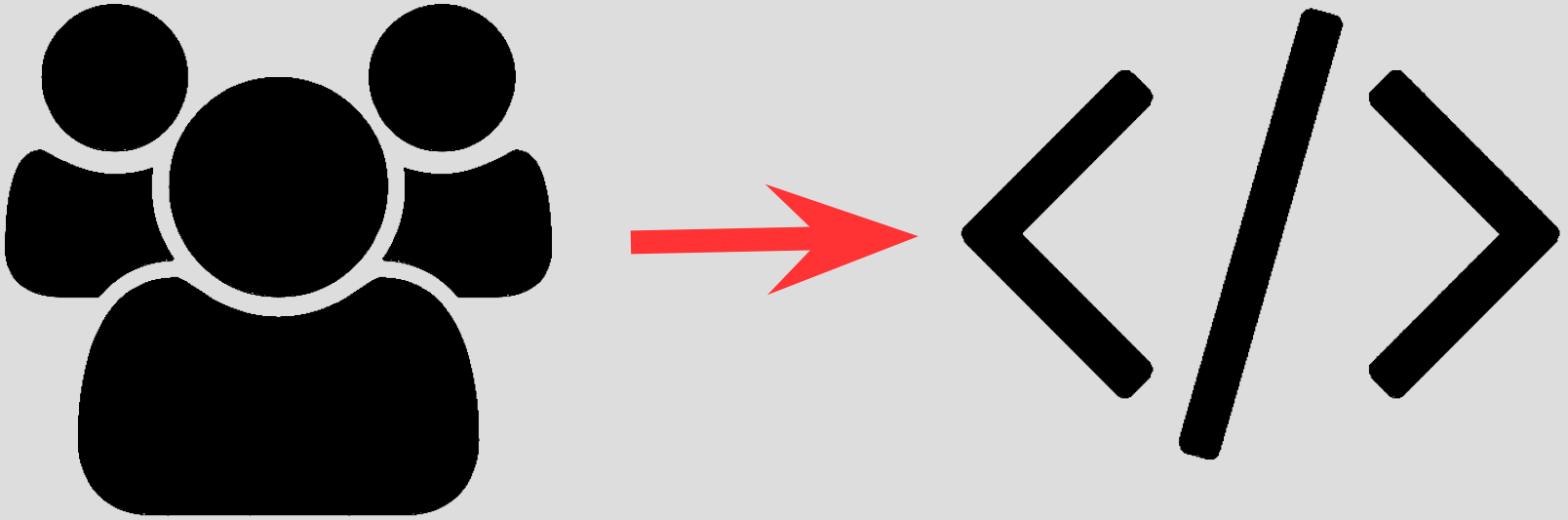
1 código

++ usuários



1 código

++ programadores



biblioteca

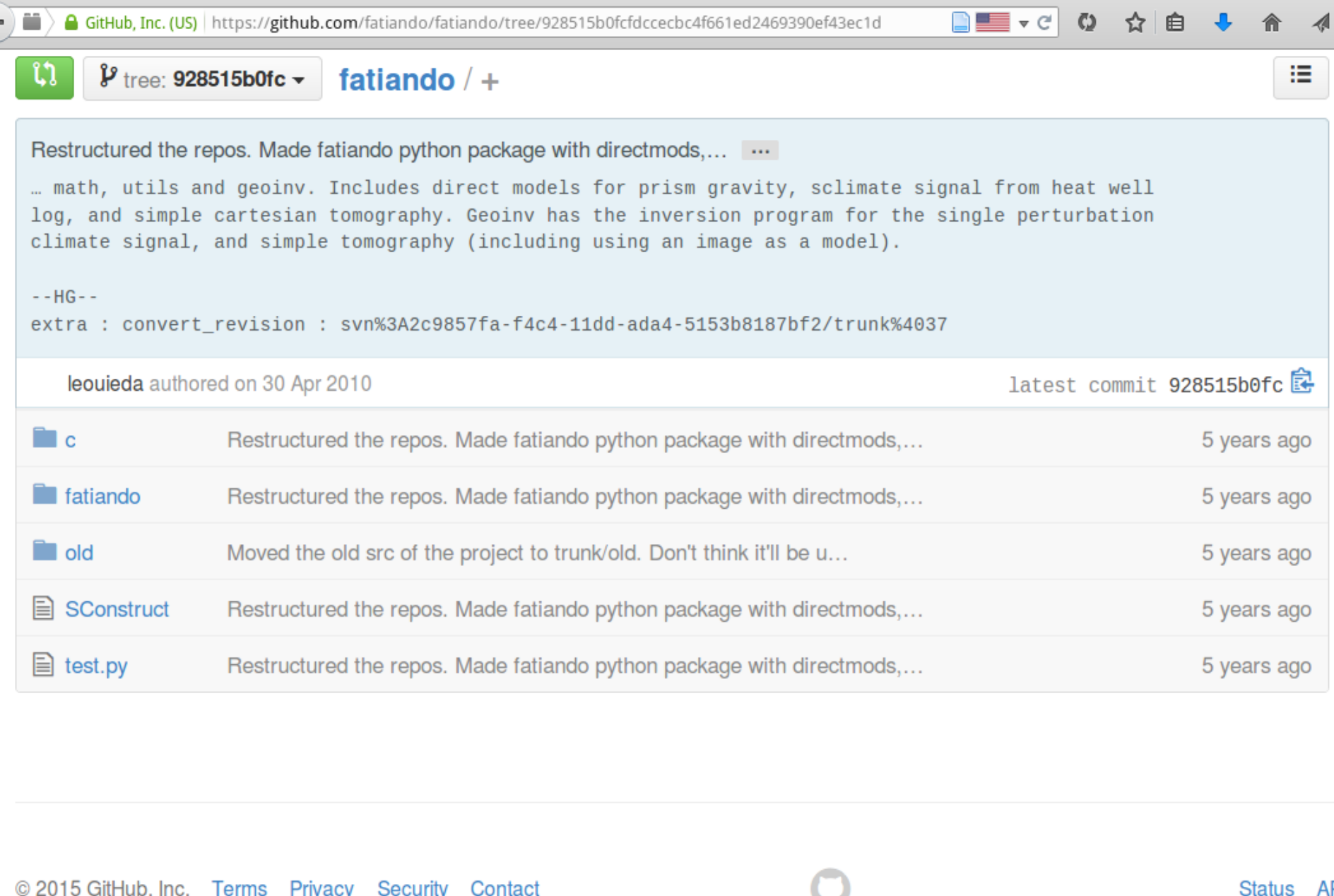
(funções, classes, etc)

python™

fácil de aprender

rápido de implementar

github.com


GitHub, Inc. (US) https://github.com/fatiando/fatiando/tree/928515b0fcfdccecbc4f661ed2469390ef43ec1d
tree: 928515b0fc
fatiando / +
Restructured the repos. Made fatiando python package with directmods,...
… math, utils and geoinv. Includes direct models for prism gravity, sclimate signal from heat well log, and simple cartesian tomography. Geoinv has the inversion program for the single perturbation climate signal, and simple tomography (including using an image as a model).
--HG--
extra : convert_revision : svn%3A2c9857fa-f4c4-11dd-ada4-5153b8187bf2/trunk%4037
leouieda authored on 30 Apr 2010
latest commit 928515b0fc
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old Moved the old src of the project to trunk/old. Don't think it'll be u... 5 years ago
SConstruct Restructured the repos. Made fatiando python package with directmods,... 5 years ago
test.py Restructured the repos. Made fatiando python package with directmods,... 5 years ago
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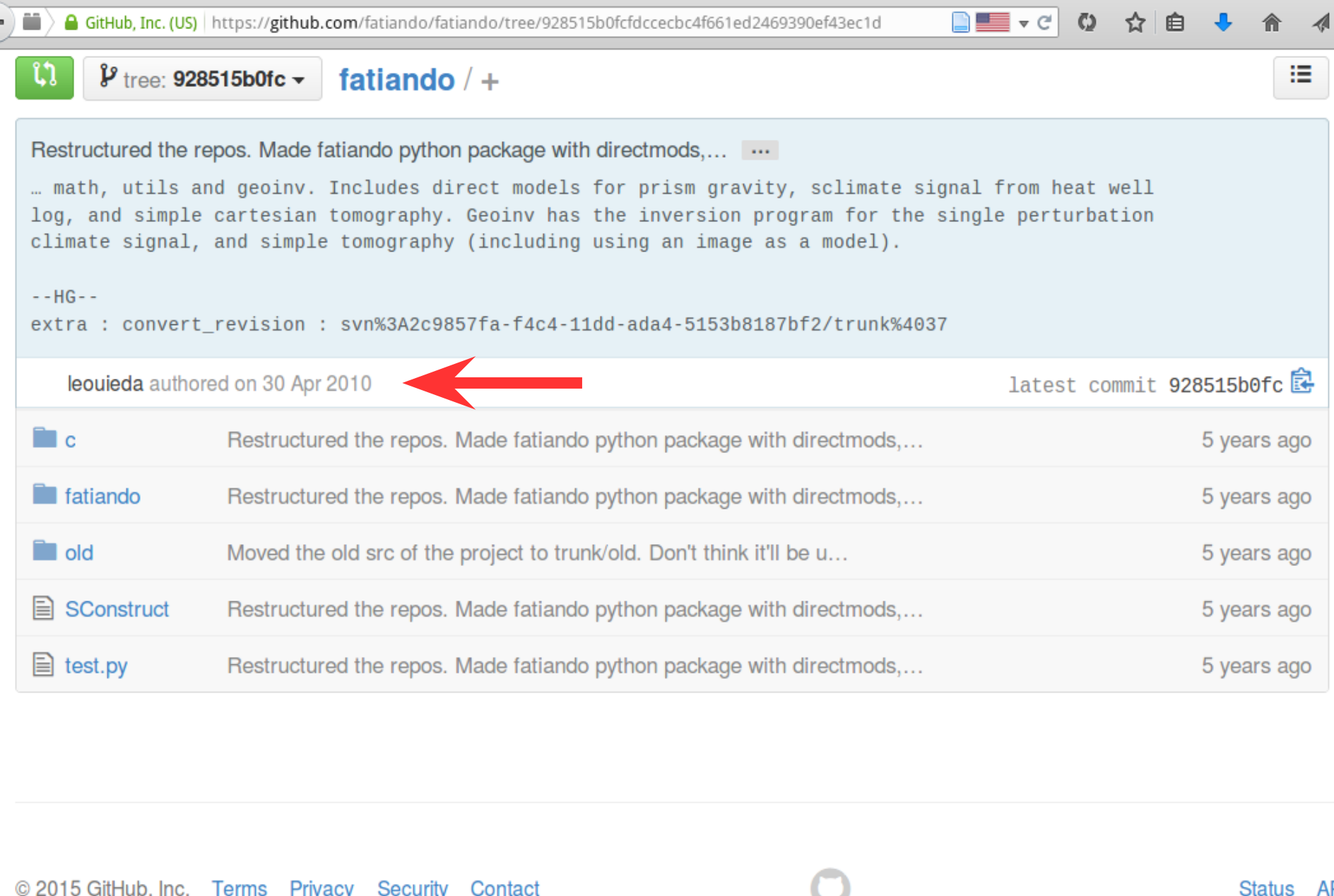
Status API

github.com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tree: 928515b0fc
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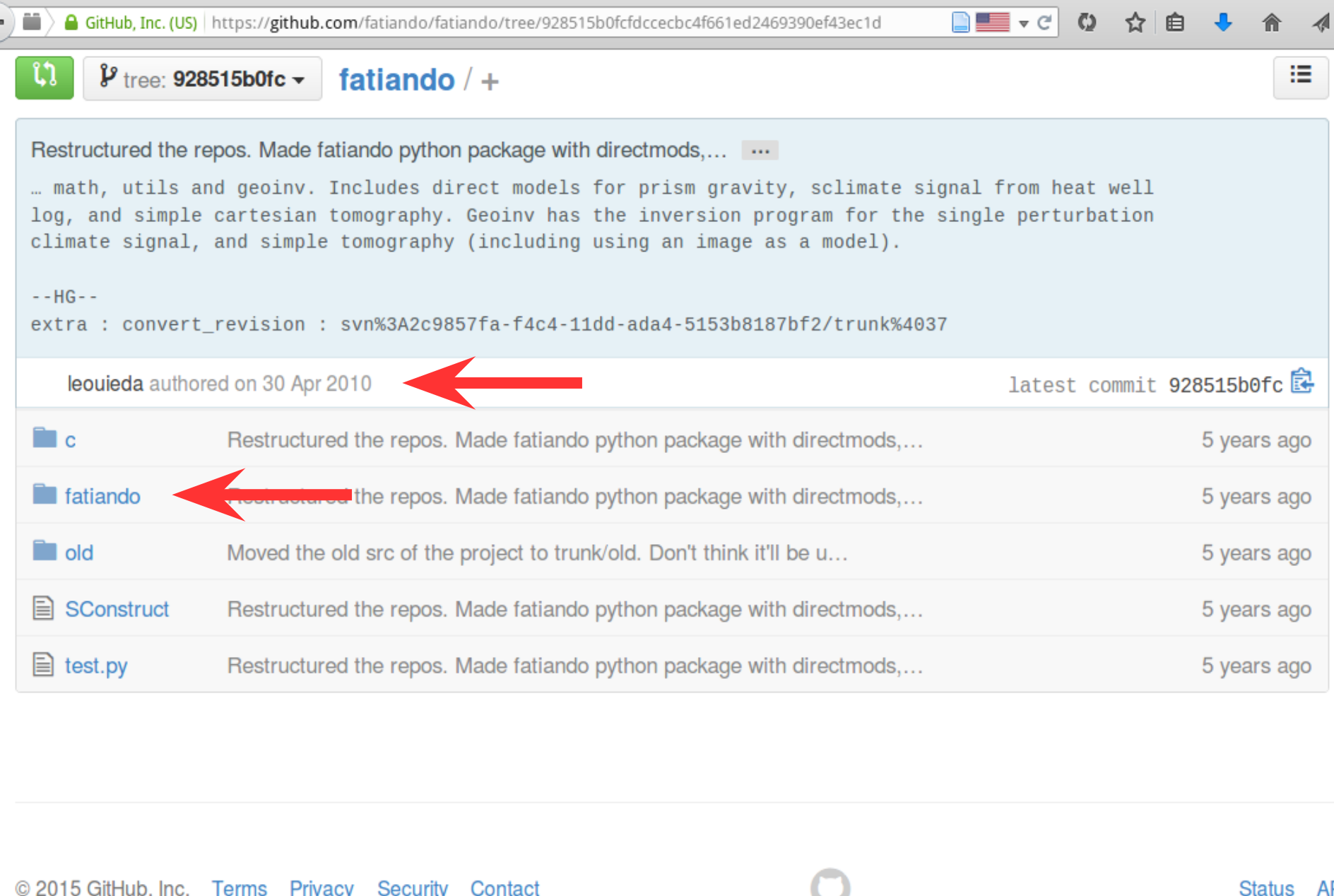
GitHub, Inc. (US) https://github.com/fatiando/fatiando/tree/928515b0fcfdccecbc4f661ed2469390ef43ec1d
tree: 928515b0fc
fatiando / +
Restructured the repos. Made fatiando python package with directmods,... ...
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test.py Restructured the repos. Made fatiando python package with directmods,... 5 years ago
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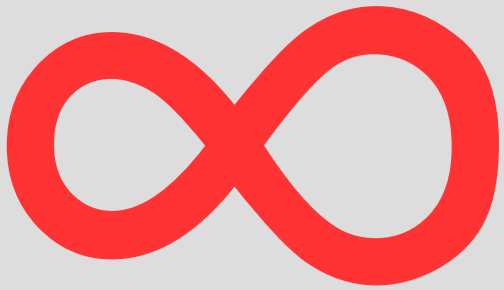
Status API

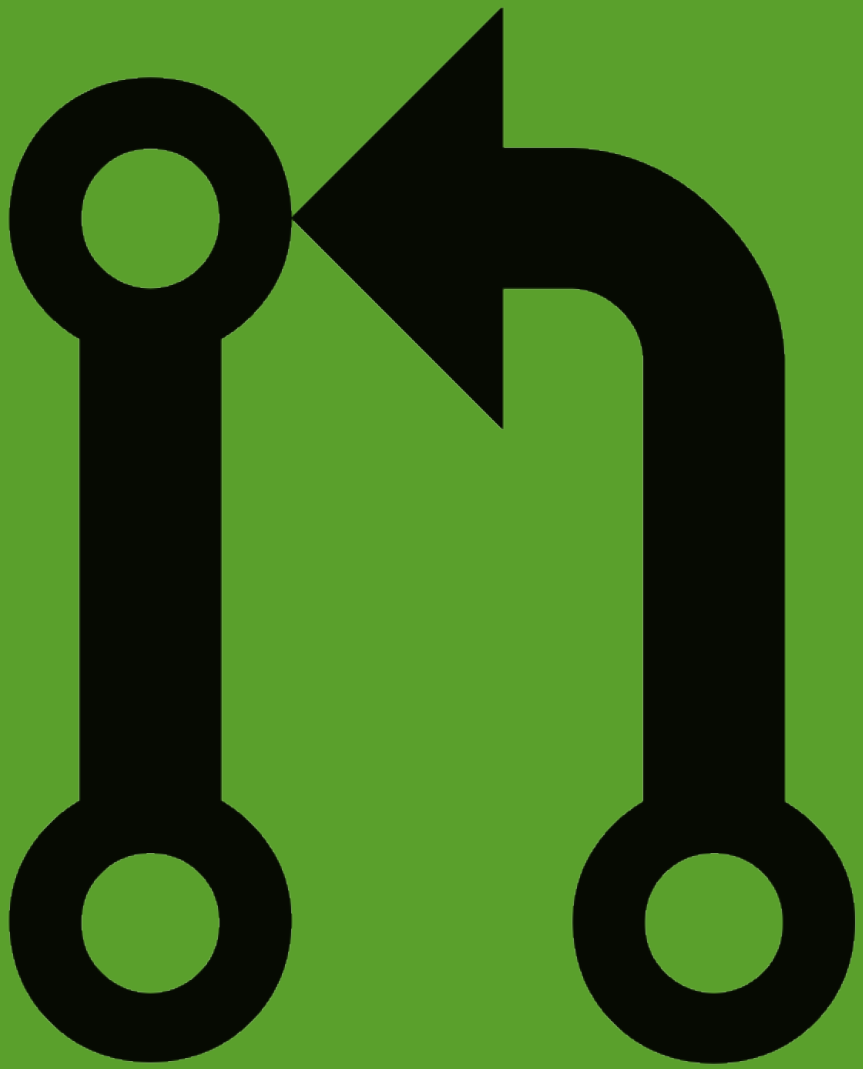
controle de versão (VCS)

ctrl+z



git/mercurial

software-carpentry.org



v0.0.1

(pré-beta-dev-testing)

curso de inversão

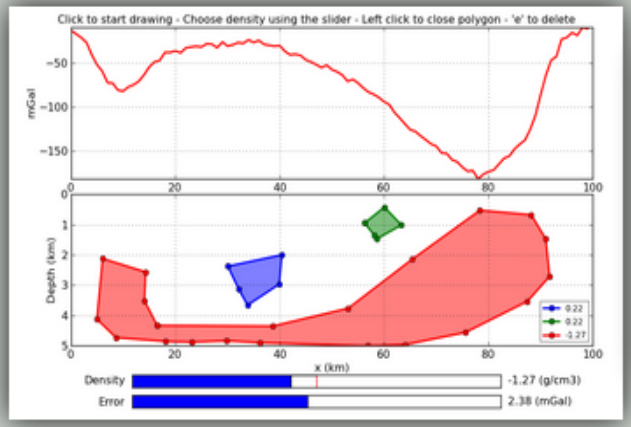
IAG 02/2011

github.com/pinga-lab/inversao-iag-2012

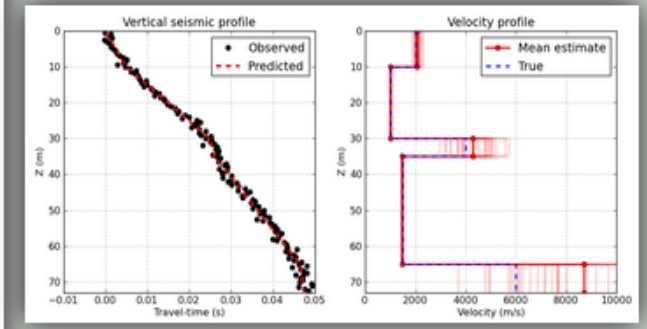
Example Gallery

Some of the functionality already implemented:

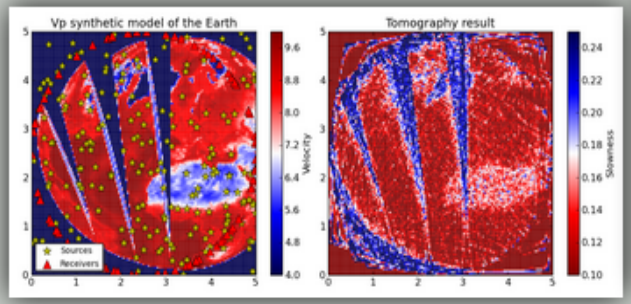
Moulder - 2D gravimetric direct modeling



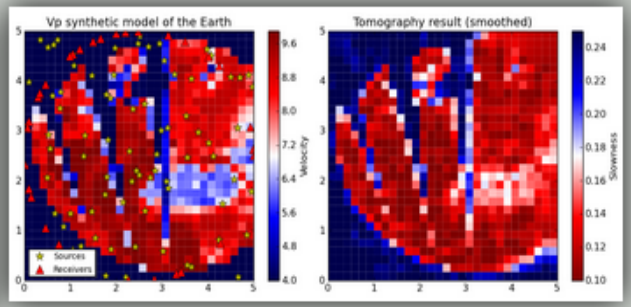
Inversion of synthetic vertical seismic profile data



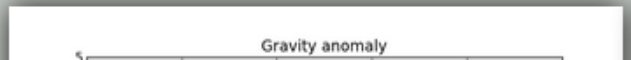
Straight-ray travel-time tomography of large models using sparse linear algebra



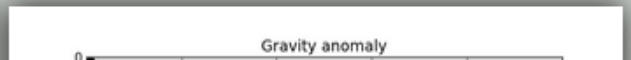
Straight-ray travel-time tomography

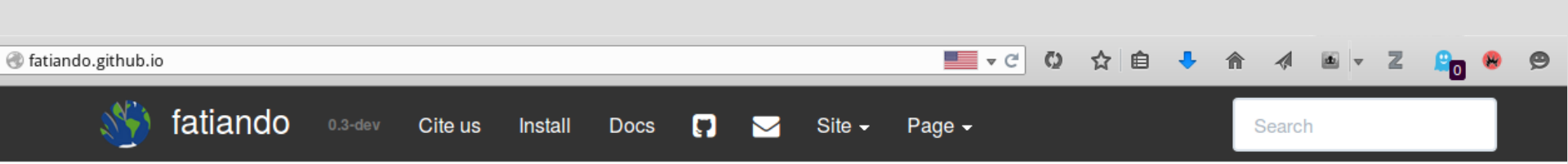


Simple inversion for the relief of tha 2D triangular basin



... and also a trapezoidal basin





fatiando a terra

modeling and inversion in geophysics

An easy and flexible way to perform and implement geophysical data analysis.

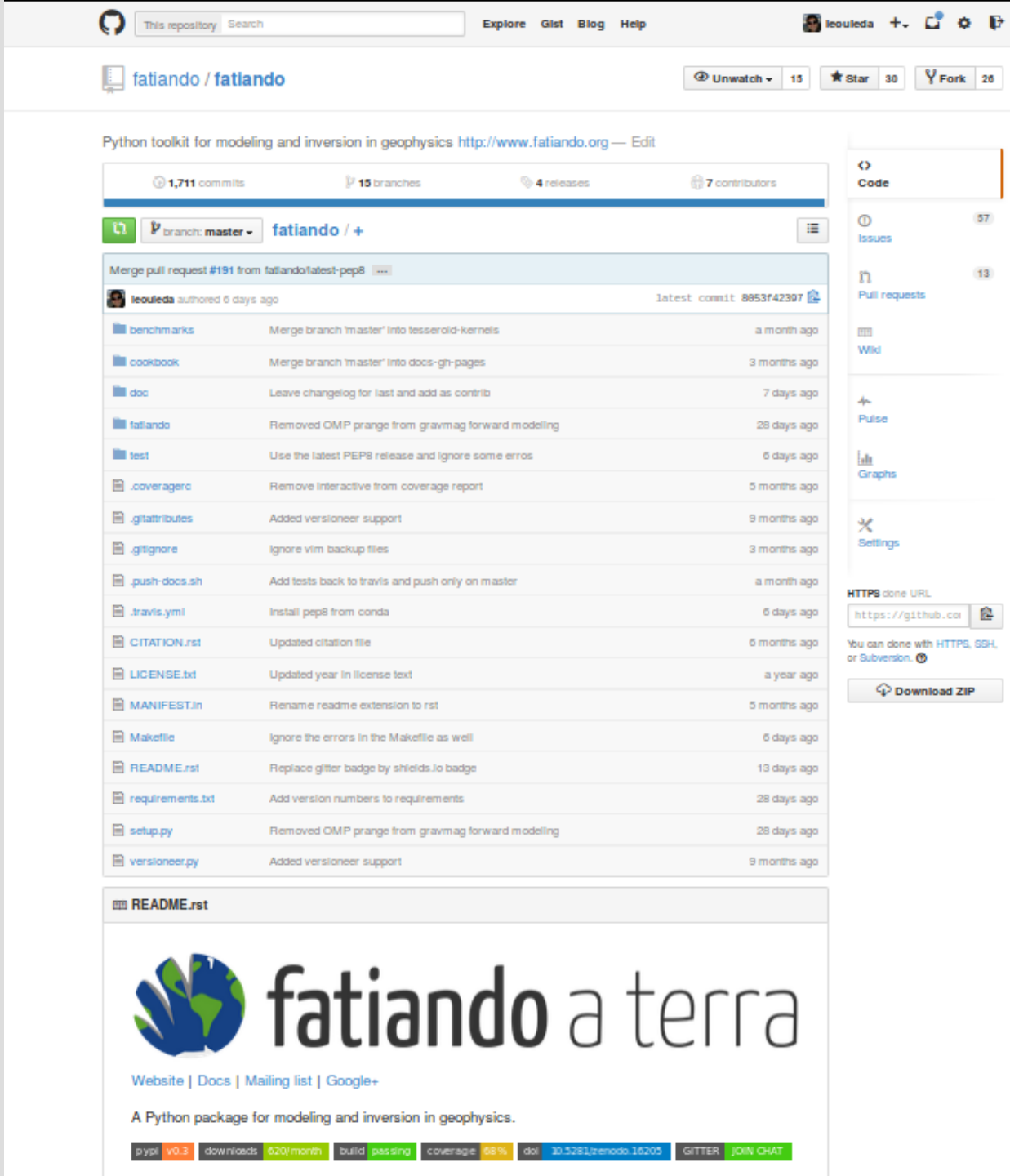
All from inside the powerful Python language.

Fatiando is built on top of the Scipy ecosystem: Numpy, Cython, matplotlib, Mayavi, etc. Current capabilities include:

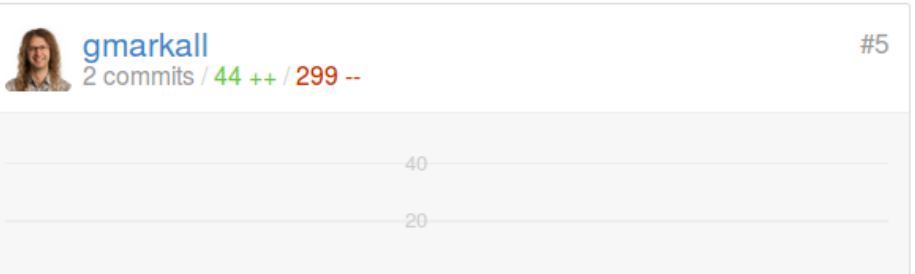
- *Data processing*
- *Generate synthetic data*
- *Forward modeling*
- *Inversion*
- *2D and 3D visualization*

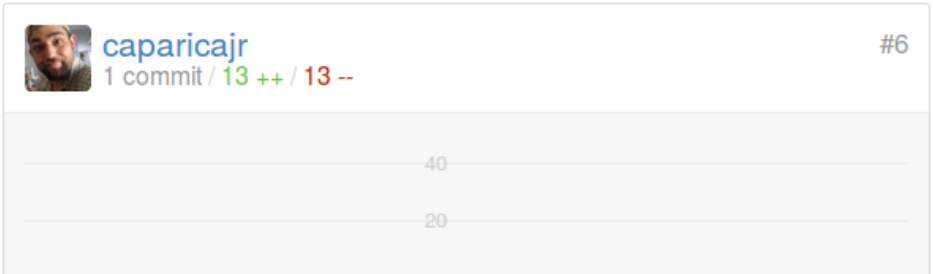
~700 downloads/mês

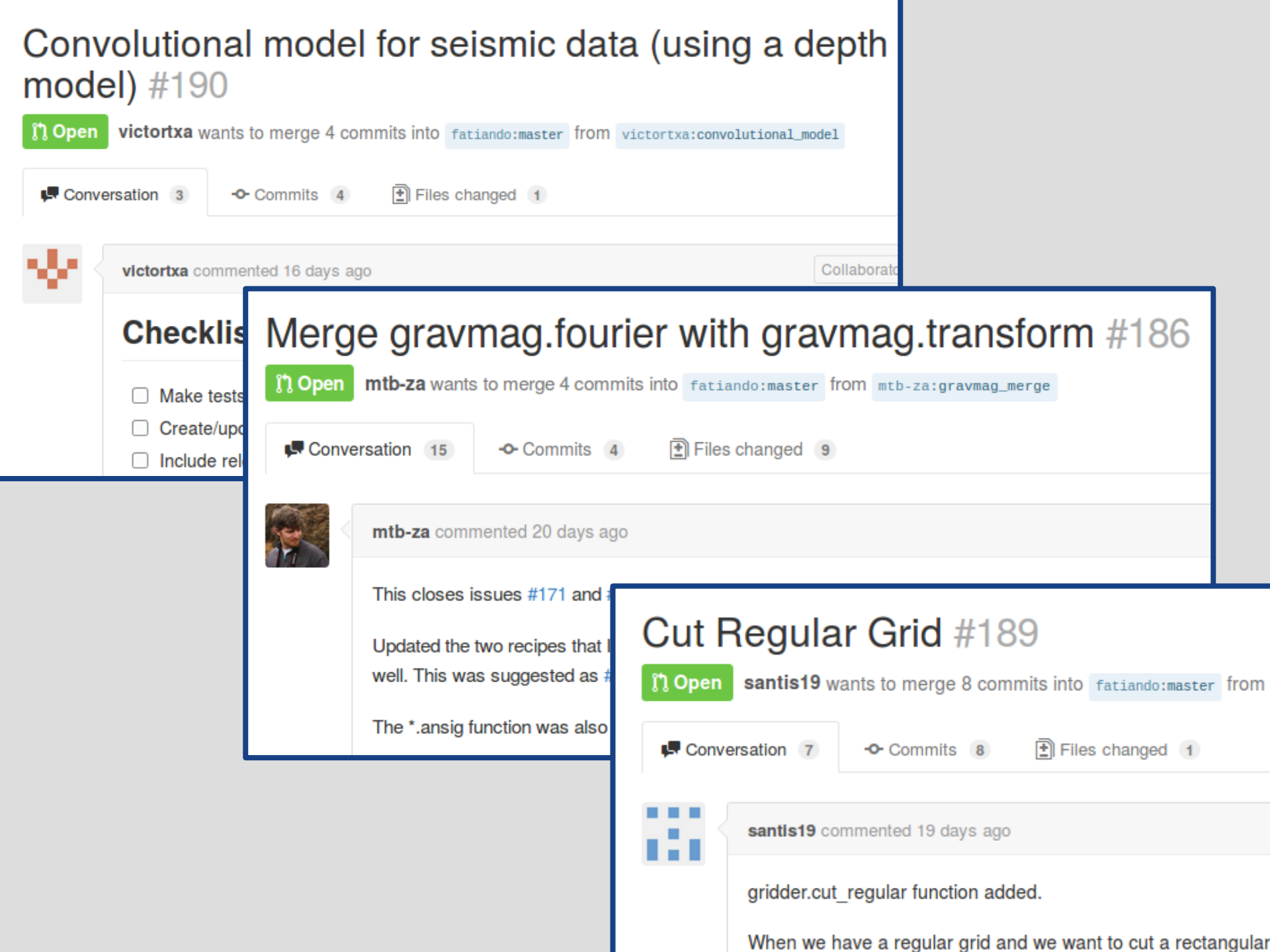
código no GitHub



contribuidores






Convolutional model for seismic data (using a depth model) #190
Open victortxa wants to merge 4 commits into fatiando:master from victortxa:convolutional_model
Conversation 3
Commits 4
Files changed 1
victortxa commented 16 days ago
Merge gravmag.fourier with gravmag.transform #186
Open mtb-za wants to merge 4 commits into fatiando:master from mtb-za:gravmag_merge
Conversation 15
Commits 4
Files changed 9
mtb-za commented 20 days ago
Cut Regular Grid #189
Open santis19 wants to merge 8 commits into fatiando:master from
Conversation 7
Commits 8
Files changed 1
santis19 commented 19 days ago
gridder.cut_regular function added.

fatiando

diversos métodos

+

inversão

+

visualização

biblioteca

pacotes >

módulos >

funções/classes

fatiando/

gravmag/
seismic/
inversion/
vis/

gridder
mesher
utils
constants
datasets

pacotes

módulos

tour

demo 1

Anomalia Bouguer de um prisma

IPython notebook

ipython.org

demo 2

Prisma poligonal e interatividade

aulas

exploração

interatividade


credit: AVTC Series

modelos

dados sintéticos

dados reais

IPython

+

fatiando

exemplo 1

modelagem direta

exemplo 2

anomalia magnética

exemplo 3

ondas sísmicas

pesquisa

criação de

métodos

de inversão

minimizar

$$\phi(\bar{p}) = \sum_{i=1}^{N} [d_i^o - d_i(\bar{p})]^2$$

exemplo:

Método de Newton

$$\nabla^2 \Phi \, \Delta \bar{p} = -\nabla \Phi$$

Hessiana

gradiente

aproximação

$$\nabla^2 \Phi \approx \bar{\bar{J}}^T \bar{\bar{J}}$$

Jacobiana

regularização

$$\Gamma(\bar{p}) = \sum_{i=1}^{N} [d_i^o - d_i(\bar{p})]^2 + \mu \sum_{j=1}^{M} p_j^2$$

regularização

$$\Gamma(\bar{p}) = \sum_{i=1}^{N} [d_i^o - d_i(\bar{p})]^2 + \mu \sum_{j=1}^{M} p_j^2$$

$$\left(\nabla^2 \Phi + \mu \nabla^2 \Theta\right) \Delta\bar{p} = -\nabla\Phi - \nabla\Theta$$

Hessiana

gradiente

componentes:

modelagem direta

Jacobiana

Hessiana

gradiente

minimização

regularização

componentes:

modelagem direta

Jacobiana

Hessiana

gradiente

minimização

regularização

genérico

componentes:

modelagem direta

Jacobiana

Hessiana

gradiente

minimização

regularização

implementar esses

genérico

fatiando.inversion

demo 1

Ajuste de reta

demo 2

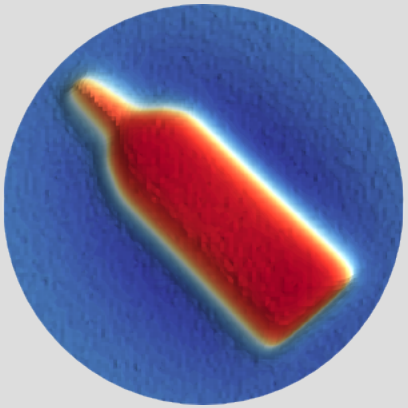
Inversão grav para relevo de bacia 2D

conclusão

construir

em cima do nosso trabalho

grupo de pesquisa



PINGA

Grupo de problemas inversos em geofísica

pinga-lab.org

People

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Victor do Couto Pereira

MSc student

Marlon Cabrera Hidalgo Gato

MSc student

André Luis Albuquerque dos Reis

MSc Student

artigos novos

método no fatiando

testes e aplicações

em IPython notebooks

Estimation of the total magnetization direction of approximately spherical bodies

by Oliveira Jr, V. C., D. P. Sales, V. C. F. Barbosa, and L. Uieda (2015)

This article is unpublished and is currently undergoing peer-review.

Info

Open-Access

Repository: pinga-lab/Total-magnetization-of-spherical-bodies

Journal: Nonlinear Processes in Geophysics

DOI: 10.5194/npgd-1-1465-2014

Supplement: 10.5281/zenodo.16191

Article Level Metrics

Abstract

We have developed a fast total-field anomaly inversion to estimate the magnetization direction of multiple sources with approximately spherical shape and known centres. Our method can be applied to interpret multiple sources with different magnetization directions. It neither requires the prior computation of any transformation like reduction to the pole nor the use of regularly spaced data on a horizontal grid. The method contains flexibility to be implemented as a linear or non-linear inverse problem, which results, respectively, in a least-squares or robust estimate of the components of the magnetization vector of the sources. [illegible]ic data show the robustness of our method against interfering anomalies and errors in the location of the sources' centre. Besides, we show the feasibility of applying the upward continuation to interpret non-spherical sources. Applications to field data over the Goiás Alkaline Province (GAP), Brazil, show the good performance of our method in estimating geological meaningful magnetization directions. The results obtained for a region of the GAP, near from the alkaline complex of Diorama, suggest the presence of non-outcropping sources marked by strong remanent magnetization with inclination and declination close to -70.35° and -19.81°, respectively. This estimated magnetization direction leads to predominantly positive reduced-to-the-pole anomalies, even for other region of the GAP, in the alkaline complex of Montes Claros de Goiás. These results show that the non-outcropping sources near from the alkaline complex of Diorama have almost the same magnetization direction of that ones in the alkaline complex of Montes Claros de Goiás, strongly suggesting that these sources have emplaced the crust almost within the same geological time interval.

Review

Total magnetization estimation methods (`fatiando.gravmag.magdir`)

Estimation of the total magnetization vector of homogeneous bodies.

It estimates parameters related to the magnetization vector of homogeneous bodies.

Algorithms

- **`DipoleMagDir`**: This class estimates the Cartesian components of the magnetization vector of homogeneous dipolar bodies with known center. The estimated magnetization vector is converted to dipole moment, inclination (positive down) and declination (with respect to x, North).

---

class **`fatiando.gravmag.magdir.`**`DipoleMagDir`(*x*, *y*, *z*, *data*, *inc*, *dec*, *points*) [source]

Bases: **`fatiando.inversion.base.Misfit`**

Estimate the magnetization vector of a set of dipoles from magnetic total field anomaly.

By using the well-known first-order approximation of the total field anomaly (Blakely, 1996, p. 179) produced by a set of dipoles, the estimation of the Cartesian components of the magnetization vectors is formulated as linear inverse problem. After estimating the magnetization vectors, they are converted to dipole moment, inclination (positive down) and declination (with respect to x, North).

Reference

Blakely, R. (1996), Potential theory in gravity and magnetic applications: CUP

Note

Assumes x = North, y = East, z = Down.

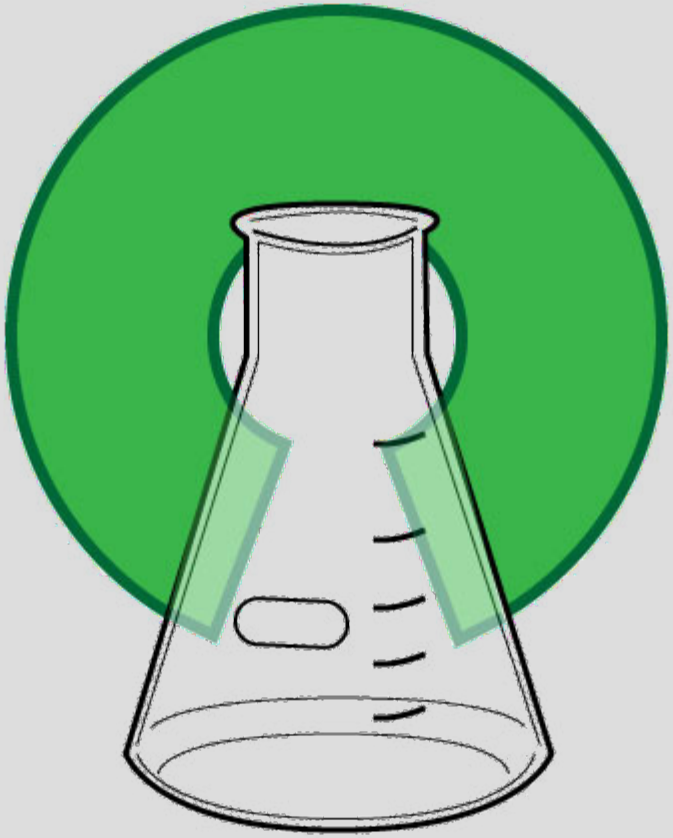
Parameters:

- **x, y, z : *1d-arrays***
  The x, y, z coordinates of each data point.

share

reuse

remix

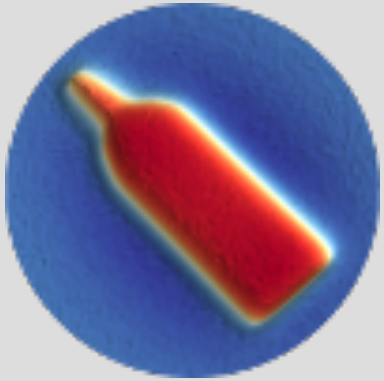


open science

credit: Greg Emmerich

Entre em contato

fatiando.github.io



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