

Cosmología con SimpleMC

Clase de Cosmopy

Instituto de Ciencias Físicas, UNAM

30 de mayo y 1 de junio, 2022

Contenido

- 1 Introducción
- 2 Estimación de parámetros
- 3 Estructura
- 4 Cómo contribuir

Análisis de datos

- Estimación de parámetros: maximización o inferencia Bayesiana.

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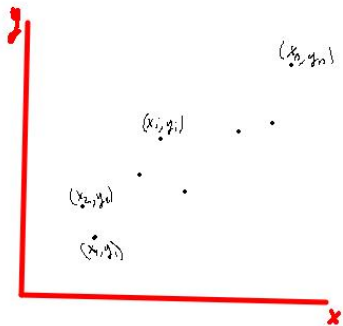
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- Estimación de parámetros: maximización o inferencia Bayesiana.
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- Reconstrucciones no paramétricas.
- Visualización.

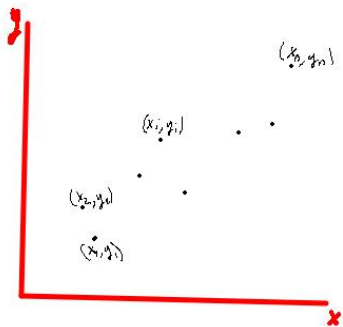
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- Reconstrucciones no paramétricas.
- Visualización.
- Interpretación física.

Estimación de parámetros

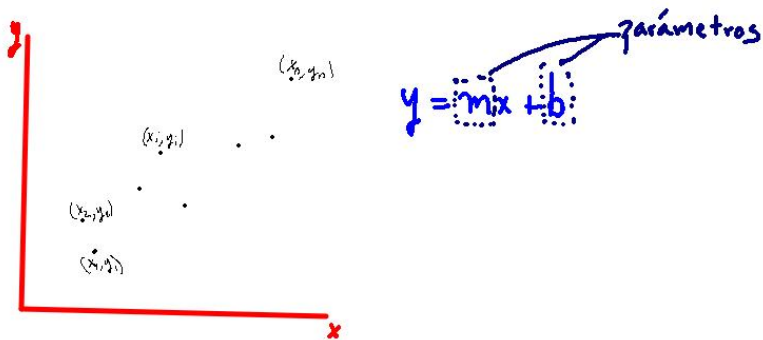


Estimación de parámetros

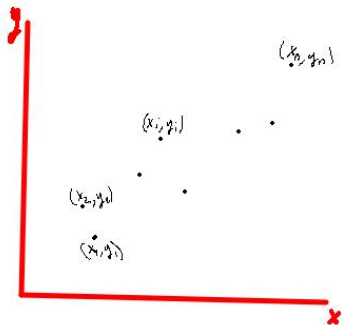


$$y = mx + b$$

Estimación de parámetros



Estimación de parámetros



$$y = \boxed{m}x + \boxed{b}$$

parámetros

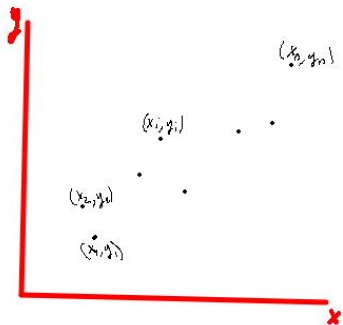
$$y_{\text{th}}(x_1) = mx_1 + b$$

$$y_{\text{th}}(x_2) = mx_2 + b$$

$$\vdots$$

$$y_{\text{th}}(x_n) = mx_n + b$$

Estimación de parámetros

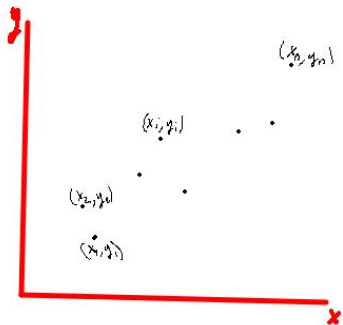


$$y = m \cdot x + b$$

Handwritten notes:

- y is labeled with a green y .
- m and b are enclosed in dashed boxes, with an arrow pointing to them from the word "parámetros".
- $y_{obs} = (y_1, \dots, y_n)$ is written in green below the equation.

Estimación de parámetros



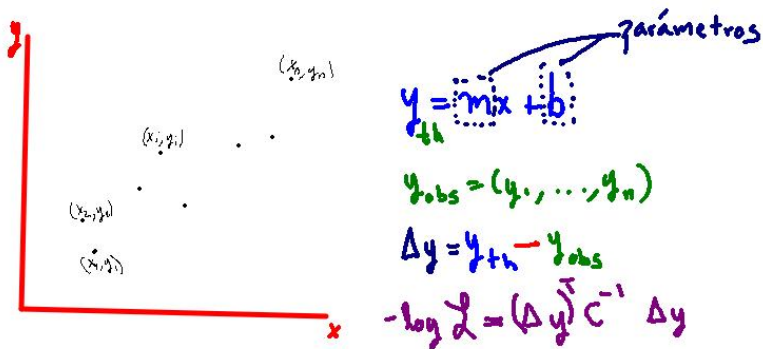
$$y = \boxed{m}x + \boxed{b}$$

parámetros

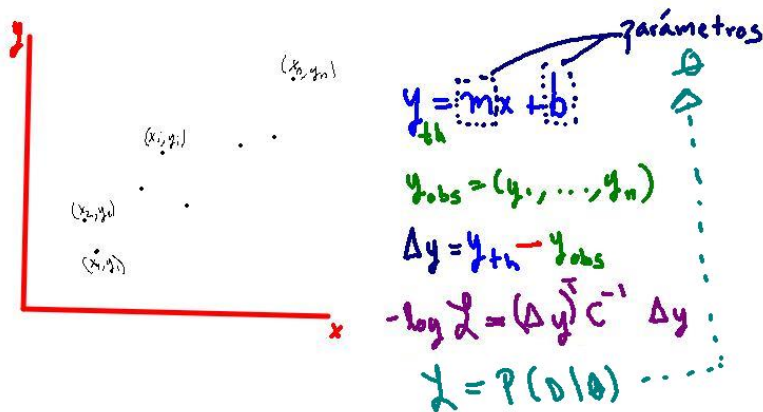
$$y_{obs} = (y_1, \dots, y_n)$$

$$\Delta y = y_{tn} - y_{obs}$$

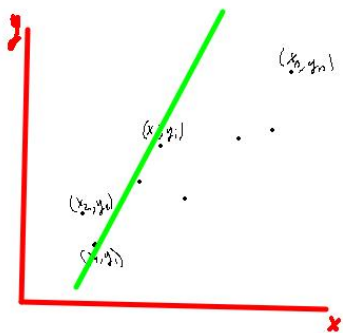
Estimación de parámetros



Estimación de parámetros



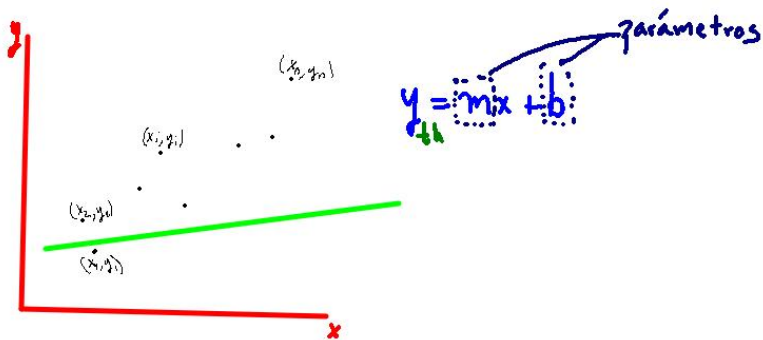
Estimación de parámetros



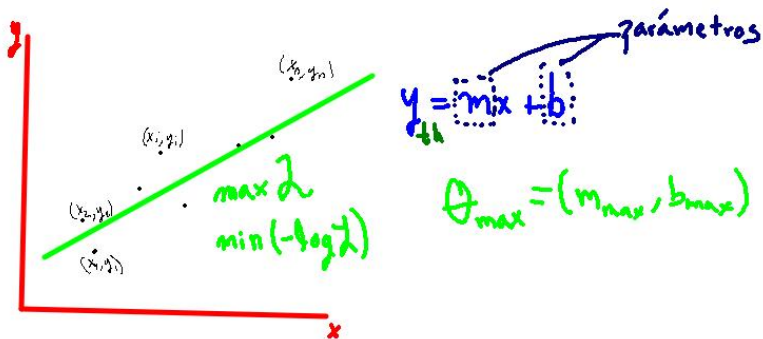
$$y = \underset{\substack{\uparrow \\ \text{parámetro}}}{m}x + \underset{\substack{\uparrow \\ \text{parámetro}}}{b}$$

parámetros

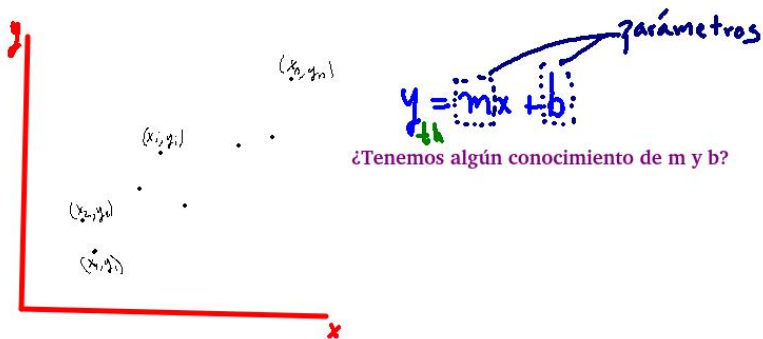
Estimación de parámetros



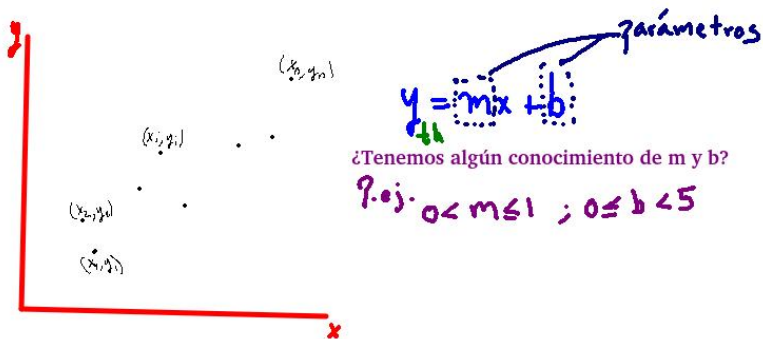
Estimación de parámetros



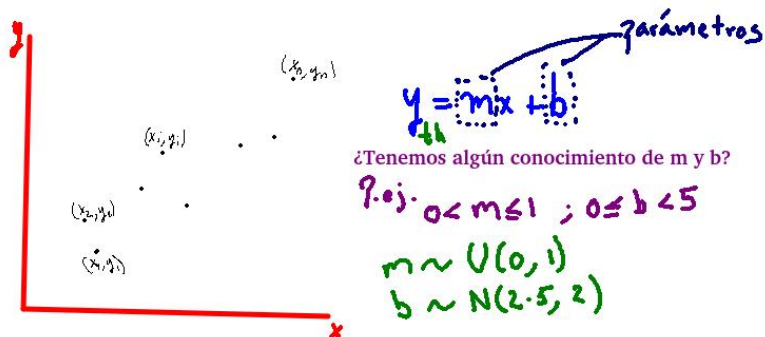
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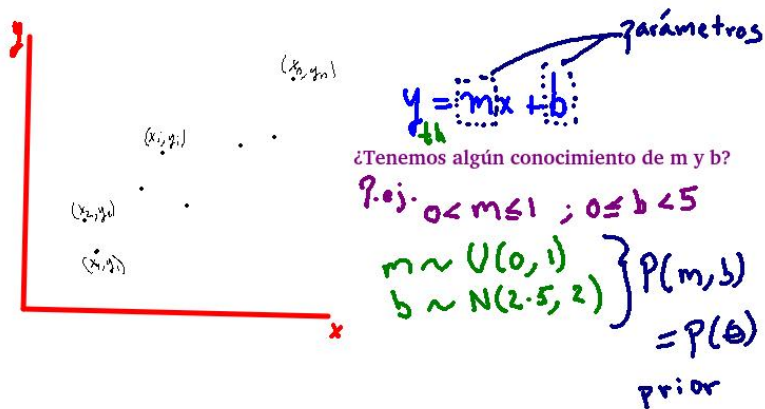
Estimación de parámetros



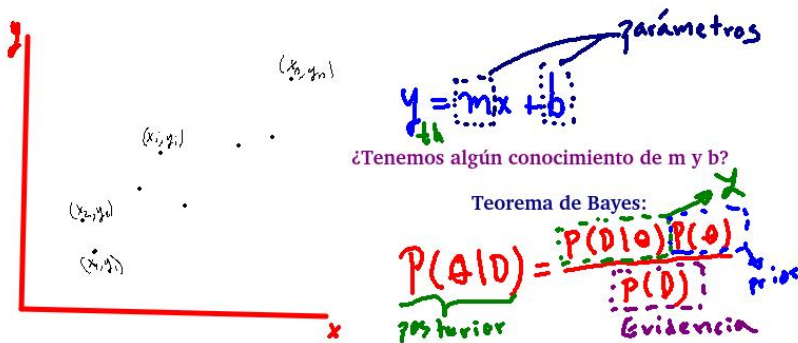
Estimación de parámetros



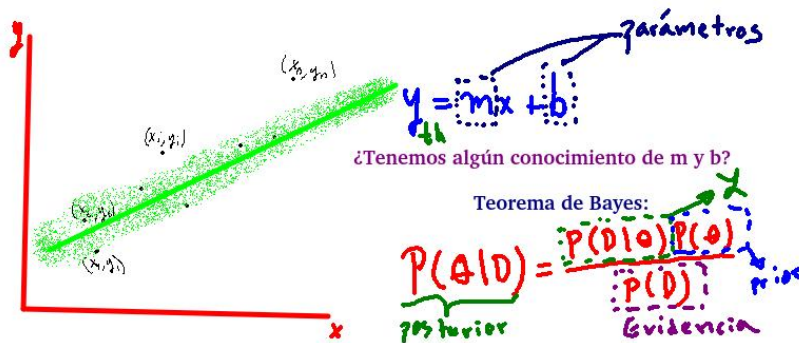
Estimación de parámetros



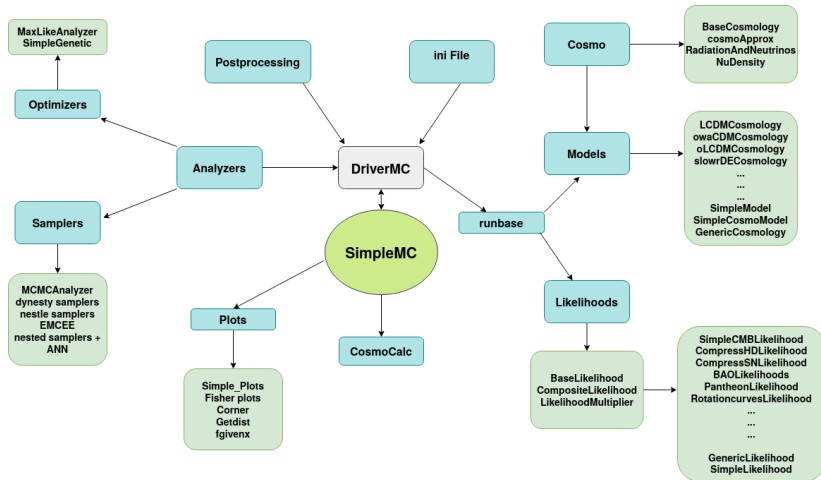
Estimación de parámetros



Estimación de parámetros



Estructura



Modelos

Modelo	Ecuación de Friedmann (H^2/H_0^2)
Λ CDM	$\Omega_{cb}a^{-3} + \Omega_{\Lambda} + \rho_{\nu+r}(z)/\rho_{\text{crit}}$
$o\Lambda$ CDM	$\Omega_{cb}a^{-3} + \Omega_{\Lambda} + \rho_{\nu+r}(z)/\rho_{\text{crit}} + \Omega_k a^{-2}$
w CDM	$\Omega_{cb}a^{-3} + \Omega_{\text{de}}a^{-3(1+w)} + \rho_{\nu+r}(z)/\rho_{\text{crit}}$
ow CDM	$\Omega_{cb}a^{-3} + \Omega_{\text{de}}a^{-3(1+w)} + \rho_{\nu+r}(z)/\rho_{\text{crit}} + \Omega_k a^{-2}$
$w_0 w_a$ CDM	$\Omega_{cb}a^{-3} + \Omega_{\text{de}}a^{-3(1+w_0+w_a)} \exp[-3w_a(1-a)] + \rho_{\nu+r}(z)/\rho_{\text{crit}}$

Datos

- SNIa
- Cronómetros cósmicos.
- BAO.
- Planck 2013 y 2015.- Versiones comprimidas de Planck-13 y Planck-15 (tratadas como un BAO a $z = 1090$)
- $f\sigma_8$

Analizadores

- Optimizadores.
- Algoritmo de inferencia Bayesiana.

Optimizadores

- MaxLikeAnalyzer.
- Algoritmo genético simple.

Inferencia Bayesiana

- Metropolis-Hastings .
- Muestreo anidado.
- Emcee.

Extras

- Métodos no paramétricos.
- MCEvidence.
- Redes neuronales.

Salidas y gráficas

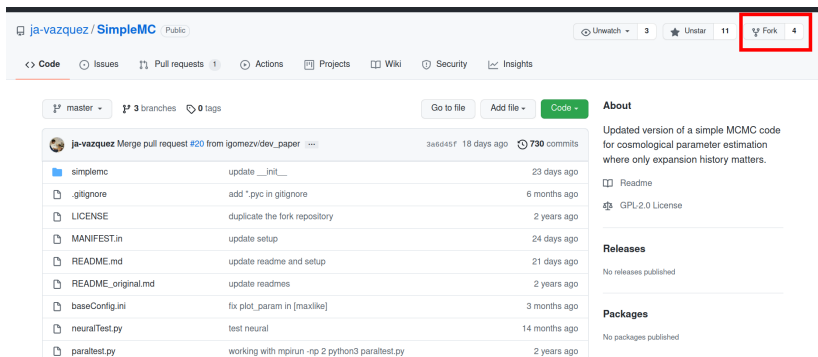
SimpleMC arroja como salida un `.paramnames`, un resumen y, para inferencia Bayesiana, un formato compatible con CosmoMC que se puede graficar con:

- `Simple_Plots` (nativo) .
- `corner`.
- `getdist`.
- `fgivenx`.

Otros

- CosmoCalc
- Archivo ini para configuración del usuario.
- MPI y multiprocessing

1. Fork al repositorio original



The screenshot shows the GitHub repository page for `ja-vazquez / SimpleMC`. The repository is public and has 3 unwatchers, 11 unstars, and 4 forks. The 'Fork' button is highlighted with a red box. Below the repository name, there are tabs for Code, Issues, Pull requests (1), Actions, Projects, Wiki, Security, and Insights. The main content area shows a list of files and their commit history. The right sidebar contains sections for About, Releases, and Packages.

ja-vazquez / SimpleMC Public

Unwatch 3 Unstar 11 Fork 4

<> Code Issues Pull requests 1 Actions Projects Wiki Security Insights

master 3 branches 0 tags

Go to file Add file Code About

ja-vazquez Merge pull request #20 from igomezv/dev_paper 3a6d45f 18 days ago 730 commits

simplemc	update __init__	23 days ago
.gitignore	add *.pyc in gitignore	6 months ago
LICENSE	duplicate the fork repository	2 years ago
MANIFEST.in	update setup	24 days ago
README.md	update readme and setup	21 days ago
README_original.md	update readmes	2 years ago
baseConfig.ini	fix plot_param in [maxlike]	3 months ago
neuralTest.py	test neural	14 months ago
paraltest.py	working with mpirun -np 2 python3 paraltest.py	2 years ago

About
Updated version of a simple MCMC code for cosmological parameter estimation where only expansion history matters.
Readme
GPL-2.0 License

Releases
No releases published

Packages
No packages published

2. Clone a la copia

igomezv / SimpleMC Public

forked from ja-vazquez/SimpleMC

<> Code Pull requests Actions Projects Wiki Security Insights Settings

master 4 branches 0 tags

Go to file Add file Code

This branch is 1 commit ahead of ja-vazquez:master.

igomezv update readme

simplemc	update __init__
.gitignore	add *.pyc in gitignore
LICENSE	duplicate the fork repository

2 years ago

Clone

HTTPS SSH GitHub CLI

`https://github.com/igomezv/SimpleMC.git`

Use Git or checkout with SVN using the web URL.

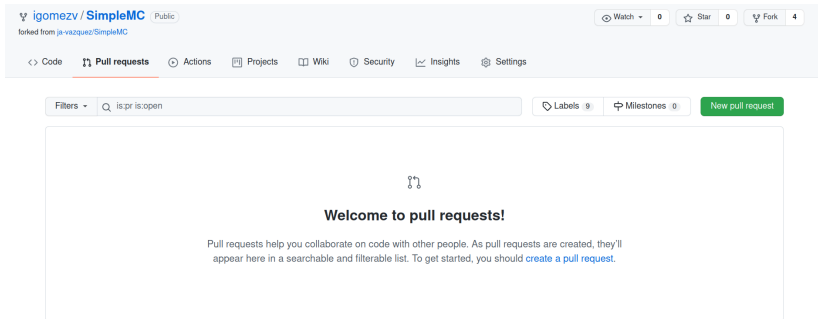
Download ZIP

```
lsidro@ubik:~/Documents/github$ git clone https://github.com/igomezv/SimpleMC.git
```

3. Commit y push a los cambios realizados en la copia

```
(base) isidro@ubik:~/Documents/gitHub/SimpleMC$ git commit -m "add X parameterization in a new DE model" simplemc/runbase.py simplemc/models/new_model.py baseConfig.ini
```

4. Pull request al repo original

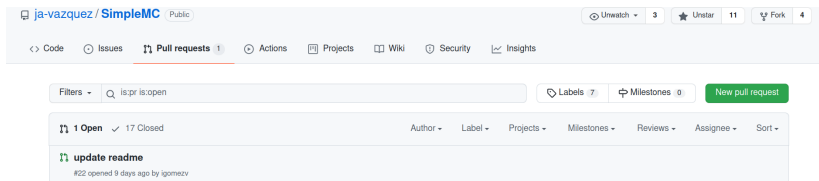


The screenshot shows the GitHub interface for the repository **igomezv / SimpleMC**, which is marked as **Public** and forked from **ja-vazquez/SimpleMC**. The repository has 0 watches, 0 stars, and 4 forks. The navigation bar includes links for Code, Pull requests (which is the active tab), Actions, Projects, Wiki, Security, Insights, and Settings.

Below the navigation bar, there is a search filter set to **is:pr is:open**. To the right of the search bar are buttons for **Labels** (9) and **Milestones** (0), along with a green **New pull request** button.

The main content area features a **Welcome to pull requests!** message, accompanied by a diagram of a pull request. The text explains that pull requests help collaborate on code and that they will appear in a searchable and filterable list. It also provides a link to **create a pull request**.

4. Pull request al repo original



The screenshot displays the GitHub interface for the repository `ja-vazquez / SimpleMC`, which is public. The top navigation bar includes links for Code, Issues, Pull requests (1), Actions, Projects, Wiki, Security, and Insights. On the right, there are buttons for Unwatch (3), Unstar (11), and Fork (4).

Below the navigation bar, the 'Pull requests' section is active. It shows a filter bar with 'Filters' and a search input containing 'is:pr is:open'. To the right of the filter bar are buttons for 'Labels' (7) and 'Milestones' (0), along with a green 'New pull request' button.

The pull request list shows 1 Open and 17 Closed pull requests. The table headers are: Author, Label, Projects, Milestones, Reviews, Assignee, and Sort. The first pull request is titled 'update readme' and was opened 9 days ago by user `igomezv`.

Práctica

- Explorar documentación:
`https://igomezv.github.io/SimpleMC/`
- Correr código:
`https://github.com/igomezv/simplemc_workshop/`

Gracias.