

Cosmología con SimpleMC

Clase de Cosmopy

Instituto de Ciencias Físicas, UNAM

30 de mayo y 1 de junio, 2022

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- 2 Estimación de parámetros
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Análisis de datos

- Estimación de parámetros: maximización o inferencia Bayesiana.

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- Reconstrucciones no paramétricas.

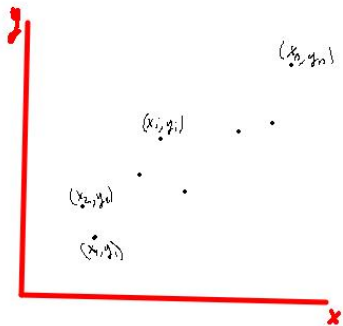
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- Estimación de parámetros: maximización o inferencia Bayesiana.
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- Reconstrucciones no paramétricas.
- Visualización.

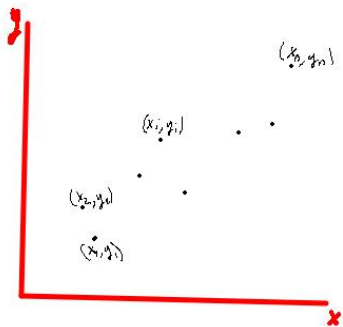
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- Reconstrucciones no paramétricas.
- Visualización.
- Interpretación física.

Estimación de parámetros

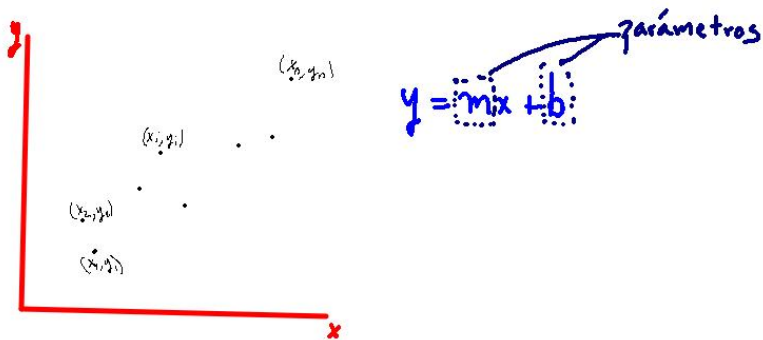


Estimación de parámetros

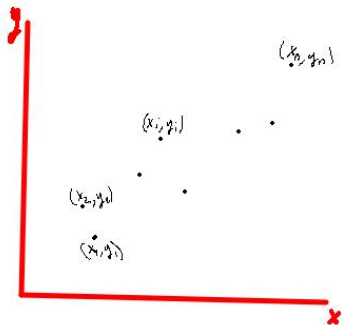


$$y = mx + b$$

Estimación de parámetros



Estimación de parámetros



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

parámetros

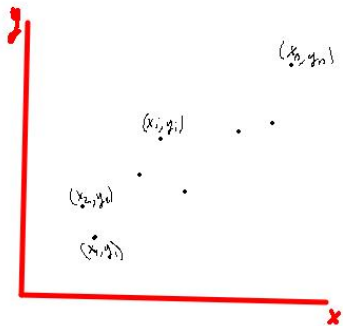
$$y_{\text{th}}(x_1) = mx_1 + b$$

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

$$\vdots$$

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

Estimación de parámetros

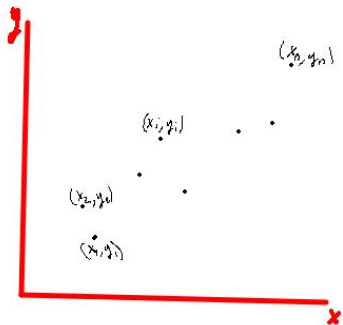


$$y = m \cdot x + b$$

Handwritten notes:

- $y_{obs} = (y_1, \dots, y_n)$
- An arrow points from the word "parámetros" to the terms m and b in the equation, indicating they are the parameters to be estimated.

Estimación de parámetros



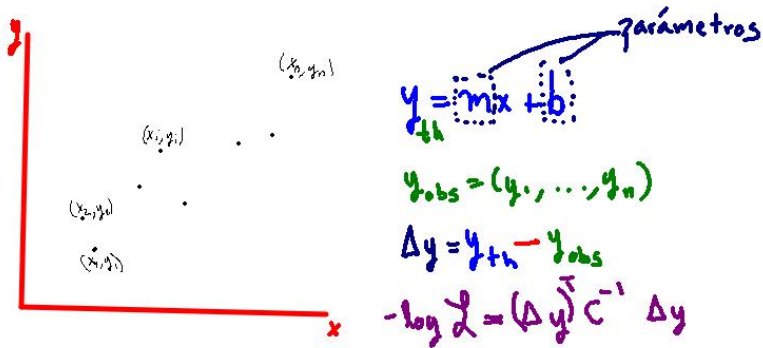
$$y = m \cdot x + b$$

Handwritten note: "parámetros" with an arrow pointing to the parameters m and b in the equation above.

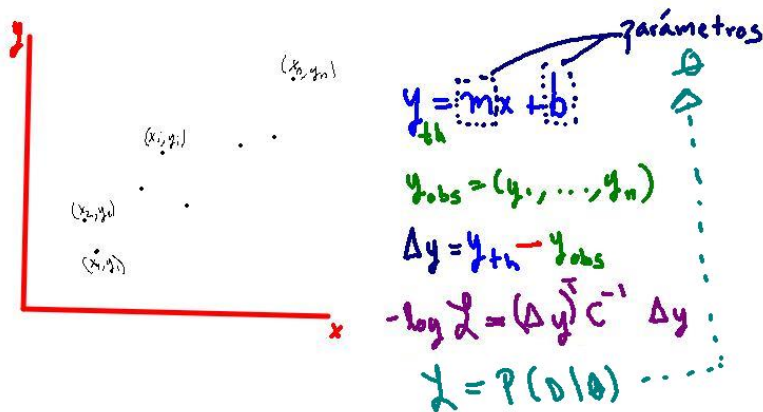
$$y_{obs} = (y_1, \dots, y_n)$$

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

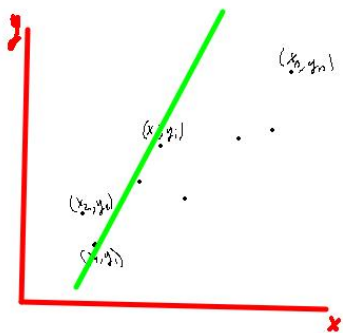
Estimación de parámetros



Estimación de parámetros



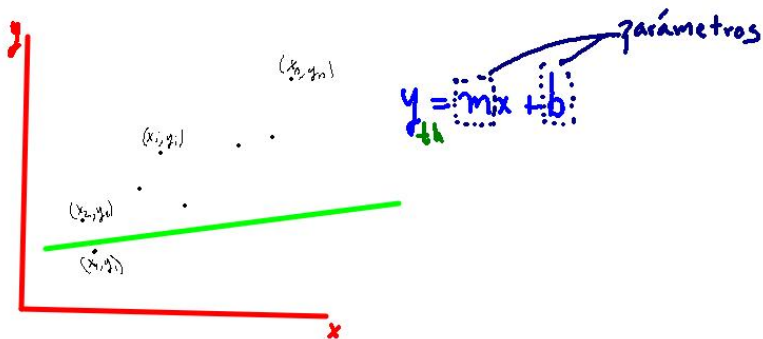
Estimación de parámetros



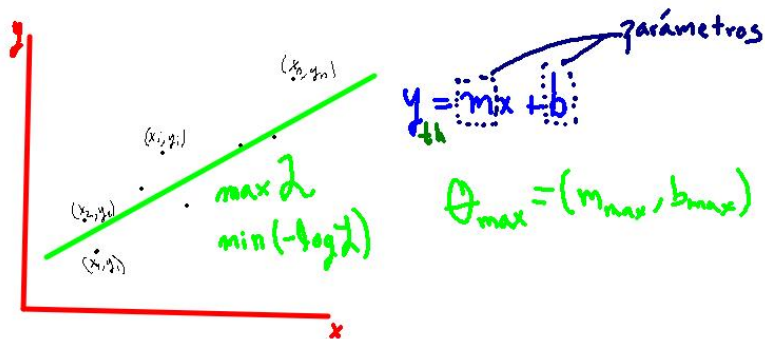
$$y = \underset{\substack{\uparrow \\ \text{parámetro}}}{m}x + \underset{\substack{\uparrow \\ \text{parámetro}}}{b}$$

parámetros

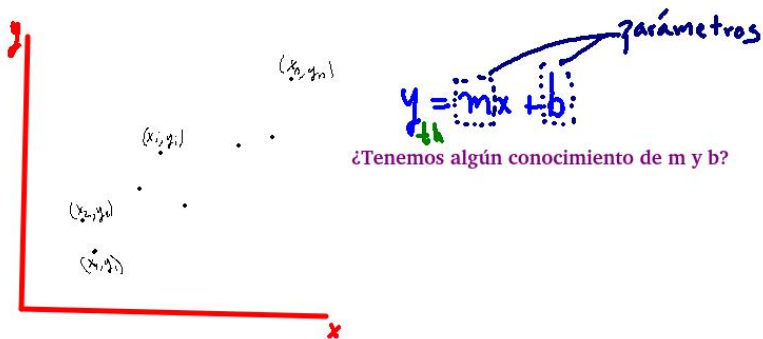
Estimación de parámetros



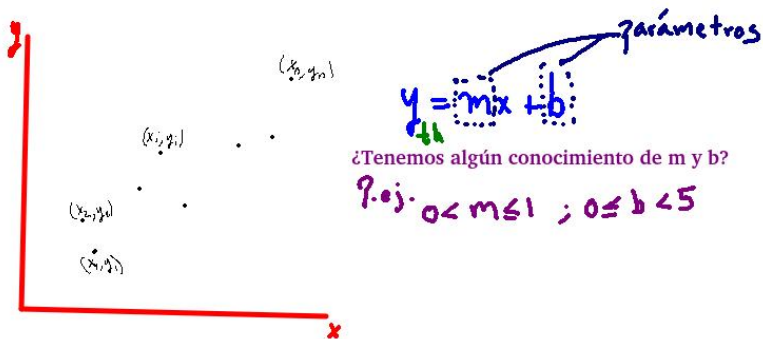
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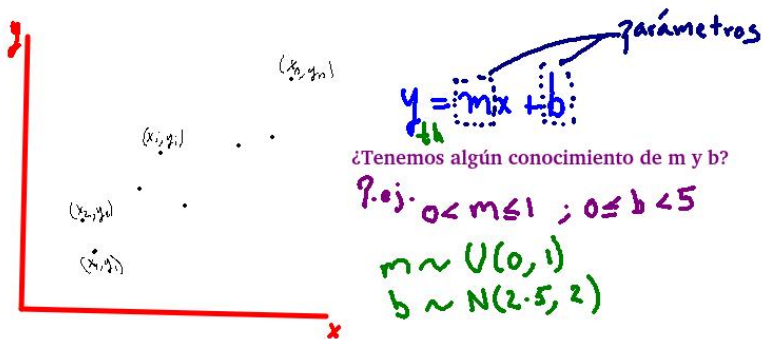
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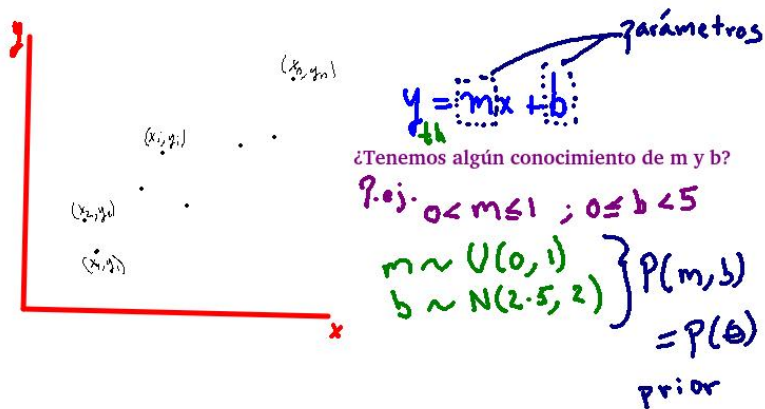
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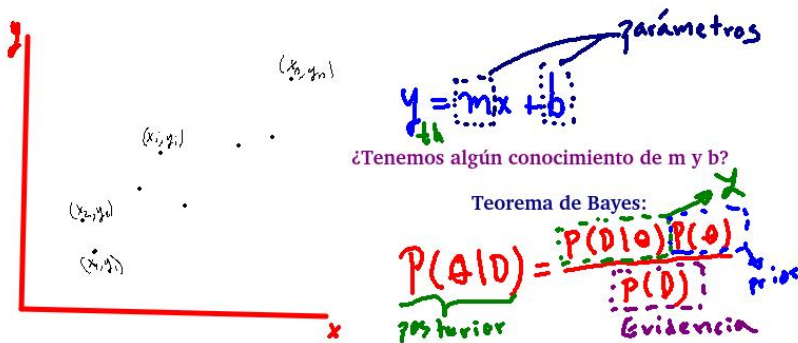
Estimación de parámetros



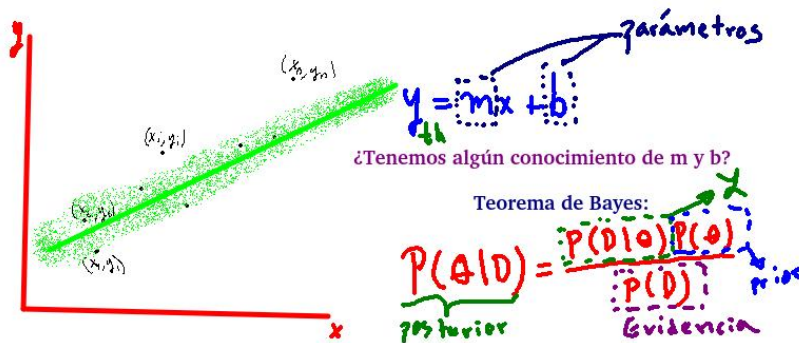
Estimación de parámetros



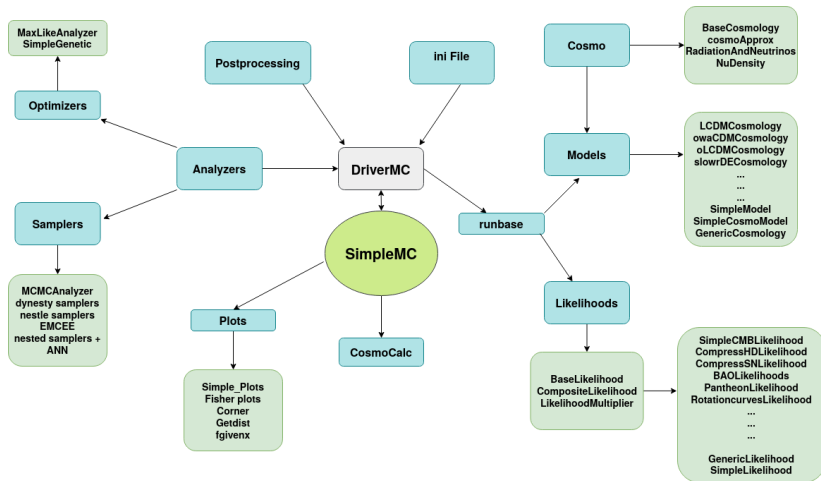
Estimación de parámetros



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 2015 y 2018.- Versiones comprimidas de Planck-15 y Planck-18 (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

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

Use Git or checkout with SVN using the web URL.

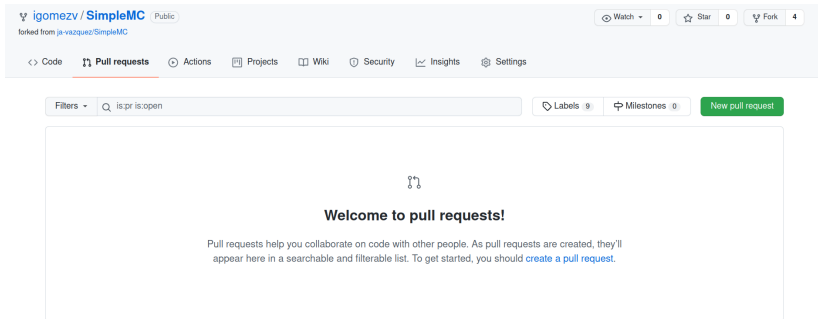
Download ZIP

```
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 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 (active), Actions, Projects, Wiki, Security, Insights, and Settings. Below the navigation bar, there is a search filter set to `is:pr is:open`, along with buttons for Labels (9) and Milestones (0), and a green button for New pull request. The main content area displays a welcome message for pull requests, explaining that they help collaborate on code and providing a link to create a pull request.

igomezv / SimpleMC Public
forked from ja-vazquez/SimpleMC

Watch 0 Star 0 Fork 4

<> Code Pull requests Actions Projects Wiki Security Insights Settings

Filters is:pr is:open Labels 9 Milestones 0 New pull request

Welcome to pull requests!

Pull requests help you collaborate on code with other people. As pull requests are created, they'll appear here in a searchable and filterable list. To get started, you should [create a pull request](#).

4. Pull request al repo original

The screenshot shows 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, there is a search filter set to `is:pr is:open`. To the right of the filter are buttons for Labels (7) and Milestones (0), and a green button labeled 'New pull request'.

The pull request list shows 1 Open and 17 Closed pull requests. The table header includes columns for Author, Label, Projects, Milestones, Reviews, Assignee, and Sort. The only open 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.