

Exemplo



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How can the Web serve me ?

ABSTRACT ■ In our technological era, the **Web** has underestimated **scientific computing**. The Web permits: **to show** our work and its value* (namely, in Engineering); **to attract** and benefit *Industry* and *Academia*; and even **to link them**. The Web can serve **me**.

We will focus **computing over the Web**, i.e.: the user (in a webpage) supplies his data, executes a program, and gets his results. **(No software installation or add-ins.)**

Mainly from cases I have used in teaching, we will address:

1. Antecedents
2. Examples
3. Possible collaborations (invitation)
4. Conclusions

** More about this later...*

1. 2. 3. 4. Antecedents

- In my academic work,
 - “Computing” ♦ “Operational Research” ♦ “Quality Control”
 - I have adopted SC **over the Web**,
 - since **1998**.
- My **first** example:
 - Area of a triangle by Heron’s* formula (year AD 60)

$$A = \sqrt{s(s-a)(s-b)(s-c)}$$

- Program (5 lines) (a, b, c , sides; s , semiperimeter)
- **About 1 year to put it on the Internet**

<http://web.tecnico.ulisboa.pt/mcasquilho/compute/misc/F-triang.html>

* [Heron of Alexandria](#) (AD 10 ?–75 ?)

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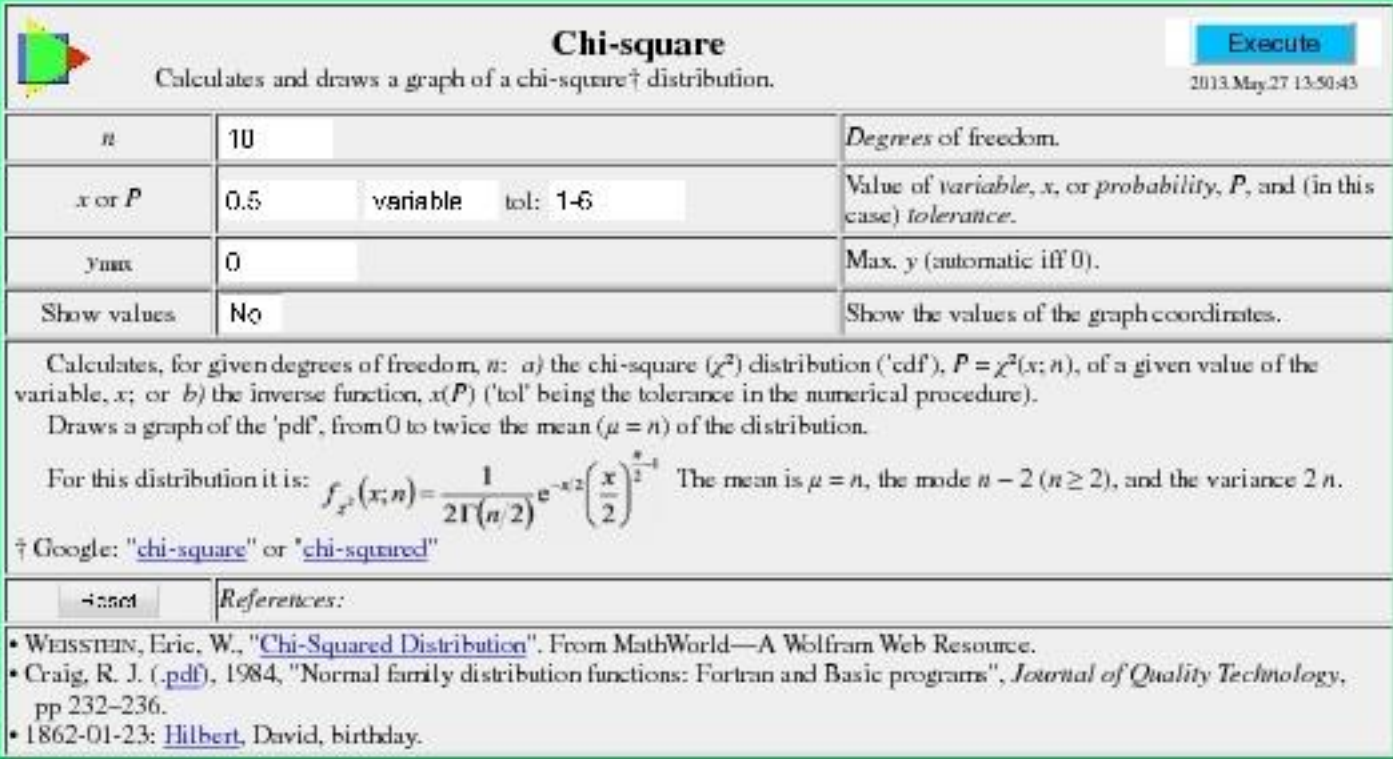


Silva Porto
(1850–1893)
Colheita — ceifeiras
1893
(Harvest, reapers)

1. 2. 3. 4. Examples

- **Chi-square** ➔ Try $\nu = 3$, $\nu = 50$ (nearly Gaussian)

<http://web.tecnico.ulisboa.pt/mcasquilho/compute/qc/Fx-chisquare.php>



Chi-square
Calculates and draws a graph of a chi-square† distribution. Execute
2013.May.27 13:50:43

n	10	Degrees of freedom.
x or P	0.5 <input type="checkbox"/> variable <input type="checkbox"/> tol: 1-6	Value of variable, x , or probability, P , and (in this case) tolerance.
y_{\max}	0	Max. y (automatic iff 0).
Show values	No	Show the values of the graph coordinates.



Calculates, for given degrees of freedom, n : a) the chi-square (χ^2) distribution ('cdf'), $P = \chi^2(x; n)$, of a given value of the variable, x ; or b) the inverse function, $x(P)$ ('tol' being the tolerance in the numerical procedure).
Draws a graph of the 'pdf', from 0 to twice the mean ($\mu = n$) of the distribution.

For this distribution it is: $f_{\chi^2}(x; n) = \frac{1}{2\Gamma(n/2)} e^{-x/2} \left(\frac{x}{2}\right)^{n/2-1}$ The mean is $\mu = n$, the mode $n - 2$ ($n \geq 2$), and the variance $2n$.

† Google: "[chi-square](#)" or "[chi-squared](#)"

References:

- WEISSTEIN, Eric, W., "[Chi-Squared Distribution](#)". From MathWorld—A Wolfram Web Resource.
- Craig, R. J. (.pdf), 1984, "Normal family distribution functions: Fortran and Basic programs", *Journal of Quality Technology*, pp 232–236.
- 1862-01-23: [Hilbert](#), David, birthday.

  <http://web.isl.utl.pt/~mcasquilho/compute/qc/Fx-chisquare.php>
Created: 2008-01-23 — Last modified: 2011-11-07

(Images are hyperlinks)

1. 2. 3. 4. Examples

- Fraction defective (Quality Control) \Rightarrow Try σ_{low} , $\sigma_{upp} = 10, 1$.

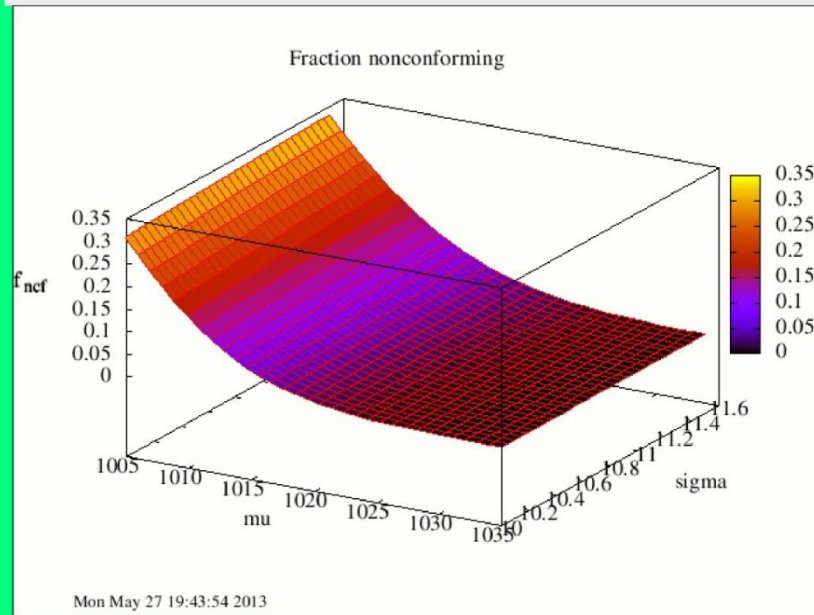
<http://web.tecnico.ulisboa.pt/mcasquilho/compute/gc/Fx-fracdefective.php>

```
2013-05-27 UTC+0060 19:43:54.756
*** Graph of a surface ***
( Nov-2010, MC)

X_low, _upp,      1005.      1035.      | n_X,   31
Y_low, _upp,      10.00     11.50     | n_Y,   32
Par:   1000.      1040.      |
Show values,      0

-----
No. of points,      1056
z_min for          31 0 2.3263E-04 | at 1035.  10.00
z_max for          0 32 0.3319   | at 1005.  11.50

2013-05-27 UTC+0060 19:43:54.756
2013-05-27 UTC+0060 19:43:55.050      CPU:   0.3 sec.      End
```



[Go back using your browser.](#)

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António Dacosta
(1914–1991)
A festa
1942
(The party)

1. 2. 3. 4. Conclusions...

- **Scientific computing over the Web**
 - has been underestimated
 - can provide easy links — e.g., Industry-Academia
 - can be difficult to start, perhaps justifying its scarcity.
- Working on the Web
 - avoids platform incompatibilities (Windows, Mac, Linux)
 - obviates limitations of the user's terminal (PC, phone)
 - avoids software installation (& uninstallation)
- *Modern* (scientific) languages (Mathematica, Matlab, etc.) favour productivity, but appear *obsolete* (!), as they aren't Web-friendly (licences, permissions).

1. 2. 3. 4. ...Conclusions

- Scientific computing over the Web benefits from
 - sharing — in team work
 - visibility — attracting connections (\Rightarrow business)
 - easy access, just using a *browser*
- **Future ?** more Web; R; data bases; parallelization; “big data”; cloud computing; etc.
- Problems, collaborations: **welcome !**



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- **DEQ:** Department of Chemical Engineering, IST, UL
- **CIIST:** “Centre of Informatics of IST”, IST, UL
- **Inesc-ID:** “Instituto de Engenharia de Sistemas e Computadores, Investigação e Desenvolvimento”, Inesc Group, Lisbon
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Keywords

- Scientific computing; Web; Internet; industry, academia

Bibliography

- **Barros, M., M. Casquilho** [2019] “Linear Programming with CPLEX: an illustrative application over the Internet”, CISTI'2019, 14.^a Conferência Ibérica de Sistemas e Tecnologias de Informação (14.th Iberian Conf. on Information Systems and Technologies), Coimbra (Portugal).
- **Casquilho, M.** [2012] “Computação científica na Internet, um campo pouco explorado”, Universidade Aberta, Porto Salvo (Oeiras, Portugal), 03 Feb.
- **Casquilho, M., J. Buescu** [2011] "A minimum distance: arithmetic and harmonic means in a geometric dispute", *International Journal of Mathematical Education in Science and Technology*, **142**(3), 399–405 (doi:[10.1080/0020739X.2010.526253](https://doi.org/10.1080/0020739X.2010.526253)).
- **Casquilho, M., M. Cunha** [2015] “Applied scientific computing over the Web with remote servers: sampling with and without replacement”, CISTI'2015, Aveiro (Portugal).
- **Casquilho, M., A. Paredes , F. Rosa, J. L. Miranda** [2021] “A web-based cooling tower application”, [CISTI'2021](#), Chaves (Portugal), to be held June 2021.
- **Ferreira, M., M. Casquilho** [2013] “Scientific computing over the Internet: an example in Geometry”, WorldCIST'13, World Conference on Information Systems and Technologies, 27 Mar., Olhão (Portugal).
- **Franco, B., M. Casquilho** [2011] “A Web application for scientific computing: combining several tools and languages to solve a statistical problem”, CISTI'2011, Chaves (Portugal). **(Students: Barros, Cunha, Paredes, Ferreira, Franco)**

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