Tutorial 2 - Polynomial Regression

Abel–Ruffini theorem

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Not to be confused with Abel's theorem.

In mathematics, the **Abel–Ruffini theorem** (also known as **Abel's impossibility theorem**) states that there is no solution in radicals to general polynomial equations of degree five or higher with arbitrary coefficients. Here, *general* means that the coefficients of the equation are viewed and manipulated as indeterminates.

Proof [edit]

The proof of the Abel–Ruffini theorem predates Galois theory. However, Galois theory allows a better understanding of the subject, and modern proofs are generally based on it, while the original proofs of the Abel–Ruffini theorem are still presented for historical purposes.[1][6][7][8]

The proofs based on Galois theory comprise four main steps: the characterization of solvable equations in terms of field theory; the use of the Galois correspondence between subfields of a given field and the subgroups of its Galois group for expressing this characterization in terms of solvable groups; the proof that the symmetric group is not solvable if its degree is five or higher; and the existence of polynomials with a symmetric Galois group.

Algebraic solutions and field theory [edit]

An algebraic solution of a polynomial equation is an expression involving the four basic arithmetic operations (addition, subtraction, multiplication, and division), and root extractions. Such an expression may be viewed as the description of a computation that starts from the coefficients of the equation to be solved and proceeds by computing some numbers, one after the other.

At each step of the computation, one may consider the smallest field that contains all numbers that have been computed so far. This field is changed only for the steps involving the computation of an nth root.

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it is degree <5

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6.8.1 Power Series ¶

Recall that the sum of a geometric series can be expressed using the simple formula:

$$\sum_{n=0}^{\infty} kx^n = \frac{k}{1-x},$$

if $|x| < 1$, and that the series diverges when $|x| \geq 1$. At the time, we thought of x as an unspecified constant, but we could just as well think of it as a variable, in which case the series

$$\sum_{n=0}^{\infty} kx^n$$

Definition 6.63. Power Series Centred Around Zero. A ***power series*** is a series of the form

$$P(x) = \sum_{n=0}^{\infty} a_n x^n,$$

where the ***coefficients*** a_n are real numbers.

Source: https://www.sfu.ca/math-coursenotes/Math%20158%20Course%20Notes/sec_powerseries.html data_train.csv - perform your SGD here only

data_test.csv - do not use SGD here! Just get the loss.

$$Ax^4 + Bx^3 + Cx^2 + Dx + E = y$$

Regressor 1 → Predict if nth Term is has probability 0 or 1

Regressor 2 → Predict Coefficients (nonzero float number)

Some suggestions:

- Divide the train set into two sets: Training Set and Validation Set. This is important iso that when performing SGD, your model will not overfit the test set.
- Try a learning rate = 0.0001

References:

http://polynomialregression.drque.net/math.html#:~:text=Polynomial%20regression%20is%20one%20of,is%20a%20set%20of%20coefficients.