

# Mathematics of the cat

Teo Banica

DEPARTMENT OF MATHEMATICS, UNIVERSITY OF CERGY-PONTOISE, F-95000  
CERGY-PONTOISE, FRANCE. [teo.banica@gmail.com](mailto:teo.banica@gmail.com)

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ABSTRACT. This is an introduction to the functioning and mathematics of the cat, by insisting on neural and biomechanics aspects, with the main aim of understanding the overall cat speed. We mostly focus on the house cat, whose behavior can be observed in detail by us humans, or perhaps vice versa, but we include as well in our discussion various wild cats, small and big, and with a discussion about domestication too.

## Preface

Have you ever looked at yourself, in a mirror? We don't look very good, as humans, with our two legs, and inability to fly, we are more or less in the same category as other disfunctional animals like chicken, or ostriches. In addition, we miss fur, and a tail. All in all, any sample animal, donkey for instance, looks more majestic than us.

Well, this is how life is made, and we will have to live with this. Somehow, as a solution, the tip is to do some cycling, from time to time. That is as close as you can get to being four-legged, and a joy for both your body, and your dignity and brain.

By the way, speaking human brain, which is traditionally our point of pride, inside the animal kingdom, that is sort of disfunctional too. Kind of slow, of course, when compared to the many smart animals out there. But also a bit self-destructing, looking at the story of mankind, what seems to drive us is some sort of unhealthy desire of forming big groups, and civilizations, with the aim of negating evolution, and healthy life in general.

But let us leave these dark thoughts aside, and talk about beautiful things. We will be discussing in this book the most majestic animal of them all: the cat.

You are surely familiar with the cat. We have here, on one hand, the house cat, that extremely smart and quick creature, that you are in symbiosis with, I hope. And on the other hand, we have various wild cats, small and big, who have been revered by mankind since ages, who has not dreamed of reincarnating one day into a lion, or tiger.

But, how do these cats function? After all, skeleton, brain, muscles and everything, all this must be basically a tale of chemistry, and biology, that we can try to have some understanding of, as humans. This book will be an introduction to this:

Part I discusses cats at large, their origin, various types, and with a look into domestication too. We have a look as well at cats inside civilization, and religion.

Part II focuses on the house cat, and discusses his mighty biomechanics. Skeleton, blood, diet, muscles, and many more, we will attempt to understand here all this.

Part III keeps building on the understanding of the house cat, this time with a major challenge, having a look at his superior brain. Neurons, speed, computers, and more.

Part IV goes back to the cats at large, mostly wild, small and big, with a more advanced discussion about them, and their feats. We end with some philosophy.

This book was written over a long period of time, and in the hope that you will like it, and that it will help you become a better human, and animal. Needless to say, all this is a bit theoretical, and nothing can replace daily interacting with cats.

Speaking interacting with cats, many thanks to mine. I live in the countryside, many cats over here, of all sizes, ages and colors, ranging from fully domestic to totally wild. They come and go, with the seasons, life being quite harsh here, and I learned so many things, from every single of them. Thanks a lot, my dear cats, meow.

*Cergy, December 2024*

*Teo Banica*

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Part I

The cat

*Sail on, silver cat  
Sail on by  
Your time has come  
To shine*

## CHAPTER 1

1a.

1b.

1c.

1d.

### 1e. Exercises

Exercises:

EXERCISE 1.1.

EXERCISE 1.2.

EXERCISE 1.3.

EXERCISE 1.4.

EXERCISE 1.5.

EXERCISE 1.6.

EXERCISE 1.7.

EXERCISE 1.8.

Bonus exercise.



## CHAPTER 2

**2a.**

**2b.**

**2c.**

**2d.**

### **2e. Exercises**

Exercises:

EXERCISE 2.1.

EXERCISE 2.2.

EXERCISE 2.3.

EXERCISE 2.4.

EXERCISE 2.5.

EXERCISE 2.6.

EXERCISE 2.7.

EXERCISE 2.8.

Bonus exercise.



## CHAPTER 3

**3a.**

**3b.**

**3c.**

**3d.**

### **3e. Exercises**

Exercises:

EXERCISE 3.1.

EXERCISE 3.2.

EXERCISE 3.3.

EXERCISE 3.4.

EXERCISE 3.5.

EXERCISE 3.6.

EXERCISE 3.7.

EXERCISE 3.8.

Bonus exercise.





## CHAPTER 4

4a.

4b.

4c.

4d.

### 4e. Exercises

Exercises:

EXERCISE 4.1.

EXERCISE 4.2.

EXERCISE 4.3.

EXERCISE 4.4.

EXERCISE 4.5.

EXERCISE 4.6.

EXERCISE 4.7.

EXERCISE 4.8.

Bonus exercise.



Part II

**Biomechanics**

*Do you remember that sunny day  
Somewhere in London, in the middle of nowhere  
Didn't have nothing to do that day  
Didn't want to do nothing anyway*

## CHAPTER 5

5a.

5b.

5c.

5d.

### 5e. Exercises

Exercises:

EXERCISE 5.1.

EXERCISE 5.2.

EXERCISE 5.3.

EXERCISE 5.4.

EXERCISE 5.5.

EXERCISE 5.6.

EXERCISE 5.7.

EXERCISE 5.8.

Bonus exercise.



## CHAPTER 6

**6a.**

**6b.**

**6c.**

**6d.**

### **6e. Exercises**

Exercises:

EXERCISE 6.1.

EXERCISE 6.2.

EXERCISE 6.3.

EXERCISE 6.4.

EXERCISE 6.5.

EXERCISE 6.6.

EXERCISE 6.7.

EXERCISE 6.8.

Bonus exercise.





## CHAPTER 7

7a.

7b.

7c.

7d.

### 7e. Exercises

Exercises:

EXERCISE 7.1.

EXERCISE 7.2.

EXERCISE 7.3.

EXERCISE 7.4.

EXERCISE 7.5.

EXERCISE 7.6.

EXERCISE 7.7.

EXERCISE 7.8.

Bonus exercise.



## CHAPTER 8

8a.

8b.

8c.

8d.

### 8e. Exercises

Exercises:

EXERCISE 8.1.

EXERCISE 8.2.

EXERCISE 8.3.

EXERCISE 8.4.

EXERCISE 8.5.

EXERCISE 8.6.

EXERCISE 8.7.

EXERCISE 8.8.

Bonus exercise.



## Part III

# Brain, speed

*And I'll be waiting on the far side banks of Jordan  
I'll be sitting drawing pictures in the sand  
And when I see you coming I will rise up with a shout  
And come running through the shallow waters reaching for your hand*

## CHAPTER 9

**9a.**

**9b.**

**9c.**

**9d.**

### **9e. Exercises**

Exercises:

EXERCISE 9.1.

EXERCISE 9.2.

EXERCISE 9.3.

EXERCISE 9.4.

EXERCISE 9.5.

EXERCISE 9.6.

EXERCISE 9.7.

EXERCISE 9.8.

Bonus exercise.





## CHAPTER 10

**10a.**

**10b.**

**10c.**

**10d.**

**10e. Exercises**

Exercises:

EXERCISE 10.1.

EXERCISE 10.2.

EXERCISE 10.3.

EXERCISE 10.4.

EXERCISE 10.5.

EXERCISE 10.6.

EXERCISE 10.7.

EXERCISE 10.8.

Bonus exercise.



## CHAPTER 11

**11a.**

**11b.**

**11c.**

**11d.**

**11e. Exercises**

Exercises:

EXERCISE 11.1.

EXERCISE 11.2.

EXERCISE 11.3.

EXERCISE 11.4.

EXERCISE 11.5.

EXERCISE 11.6.

EXERCISE 11.7.

EXERCISE 11.8.

Bonus exercise.



## CHAPTER 12

**12a.**

**12b.**

**12c.**

**12d.**

**12e. Exercises**

Exercises:

EXERCISE 12.1.

EXERCISE 12.2.

EXERCISE 12.3.

EXERCISE 12.4.

EXERCISE 12.5.

EXERCISE 12.6.

EXERCISE 12.7.

EXERCISE 12.8.

Bonus exercise.



**Part IV**

**Wild cats**

*Imagine there's no heaven  
It's easy if you try  
No hell below us  
Above us, only sky*



## CHAPTER 13

**13a.**

**13b.**

**13c.**

**13d.**

**13e. Exercises**

Exercises:

EXERCISE 13.1.

EXERCISE 13.2.

EXERCISE 13.3.

EXERCISE 13.4.

EXERCISE 13.5.

EXERCISE 13.6.

EXERCISE 13.7.

EXERCISE 13.8.

Bonus exercise.



## CHAPTER 14

14a.

14b.

14c.

14d.

14e. Exercises

Exercises:

EXERCISE 14.1.

EXERCISE 14.2.

EXERCISE 14.3.

EXERCISE 14.4.

EXERCISE 14.5.

EXERCISE 14.6.

EXERCISE 14.7.

EXERCISE 14.8.

Bonus exercise.



## CHAPTER 15

**15a.**

**15b.**

**15c.**

**15d.**

**15e. Exercises**

Exercises:

EXERCISE 15.1.

EXERCISE 15.2.

EXERCISE 15.3.

EXERCISE 15.4.

EXERCISE 15.5.

EXERCISE 15.6.

EXERCISE 15.7.

EXERCISE 15.8.

Bonus exercise.



## CHAPTER 16

**16a.**

**16b.**

**16c.**

**16d.**

**16e. Exercises**

Congratulations for having read this book, and no exercises for this final chapter.





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