

MAP555 : Signal Processing ¹

Rémi Flamary

February 23, 2021

¹**Warning** : This document is currently being written and should be considered unfinished and full of mistakes and typos. It should not be used yet as a pedagogical support for a course.

Contents

1	Introduction	5
1.1	Signal processing	5
1.2	Definitions and signal properties	5
1.3	Bibliographical notes	5
2	Fourier analysis and analog filtering	7
2.1	Fourier transform	7
2.2	Frequency response and filtering	7
2.3	Applications of analog signal processing	7
3	Digital signal processing	9
3.1	Sampling and Analog/Digital conversion	9
3.2	Digital filtering	9
3.3	Finite signals	9
3.4	Applications of DSP	9
4	Random signals	11
4.1	Random Signals and Correlations	11
4.2	Frequency representation of random signals	11
4.3	AR modeling and linear prediction	11
5	Signal representations	13
5.1	Short Time Fourier Transform	13
5.2	Common signal representations	13
5.3	Source separation and dictionary learning	13
5.4	Machine learning for signal processing	13

Chapter 1

Introduction

1.1 Signal processing

See Chap [2](#) for intro to Fourier

1.2 Definitions and signal properties

1.3 Bibliographical notes

[[Haykin and Van Veen, 2007](#), [Oppenheim et al., 1997](#)]

Chapter 2

Fourier analysis and analog filtering

2.1 Fourier transform

2.2 Frequency response and filtering

2.3 Applications of analog signal processing

Chapter 3

Digital signal processing

3.1 Sampling and Analog/Digital conversion

3.2 Digital filtering

3.3 Finite signals

3.4 Applications of DSP

Chapter 4

Random signals

4.1 Random Signals and Correlations

4.2 Frequency representation of random signals

4.3 AR modeling and linear prediction

Chapter 5

Signal representations

5.1 Short Time Fourier Transform

5.2 Common signal representations

5.3 Source separation and dictionary learning

5.4 Machine learning for signal processing

Bibliography

[Haykin and Van Veen, 2007] Haykin, S. and Van Veen, B. (2007). *Signals and systems*. John Wiley & Sons.

[Oppenheim et al., 1997] Oppenheim, A. V., Willsky, A. S., and Nawab, S. H. (1997). Signals and systems prentice hall. *Inc., Upper Saddle River, New Jersey*, 7458.