

# Supplementary Material for Chapter 12: “Detection, Classification, and Estimation in the $(t, f)$ Domain”<sup>1</sup>

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The zip files contained in this directory contain the supplementary materials<sup>2</sup> (SM) for each Section of the Chapter separately. The user is advised to read the read me file for each Section to get a good overview of the contents of its SM. Below is a brief overview of the Chapter in the book, and the indication in **red** of whether SM is available, Section by Section.

## 1. Book Chapter SM Overview:

Several studies involving real-life applications have shown that methods for the detection, estimation and classification of non-stationary signals can be enhanced by utilizing the time-frequency  $((t, f))$  characteristics of such signals. Such  $(t, f)$  formulations are described in this chapter and include  $(t, f)$  matched filtering for detection and extraction of  $(t, f)$  features for classification. The topics for which SM is available are described below.

For both analysis and classification, a successful  $(t, f)$  methodology requires matching of TFDs with the structure of the signal. This can be achieved by a matching pursuit algorithm using  $(t, f)$  atoms adapted to the analyzed signals (**12.1: see page 2**). Advanced formulations and methods for  $(t, f)$  matched filtering are described and applied to abnormality detection (**12.5: see page 2**). Finally, the formulation of  $(t, f)$  features for classification (**12.6: see page 2**) is derived and applied to a serious medical problem as an illustration of the performance gained.

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<sup>1</sup> B. Boashash (ed.), Time-Frequency Signal Analysis and Processing, 2nd Edition (London: Elsevier / Academic Press, December 2015); ISBN 978-0-12-398499-9.

<sup>2</sup> All of the book supplementary materials can be found [here](#).

## 2. Book Chapter SM Main Script Inventory:

Supplementary material	Brief Description
<i>Section 12.1: Time-Frequency Signal Analysis and Classification Using Matching Pursuits</i>	
<i>main_MP_illustration</i>	This script demonstrates the principle of matching pursuit as presented in Section 12.2.2.
<i>Section 12.5: A General Approach to Time-Frequency Matched Filtering</i>	
<i>Call_functions_script.m</i>	This script produces a similar example of the results that are depicted in Table 12.5.2, on page 730 of the book.
<i>Fig_1.m</i>	This script produces similar results to the ones depicted in Fig. 12.5.1, on page 728 of the book.
<i>Section 12.6: Defining Time-Frequency Image Features by Extension from Frequency Domain or Time Domain</i>	
<i>demo_newbornEEG_classification_all.m</i>	This script produces results that are close to the ones illustrated in Table. 12.6.1, on page 739 of the book.
<i>PlotFigures.m</i>	This script produces results that are close to the ones depicted in Figs. 12.6.2 and 12.6.3, on pages 733 and 734 of the book.

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