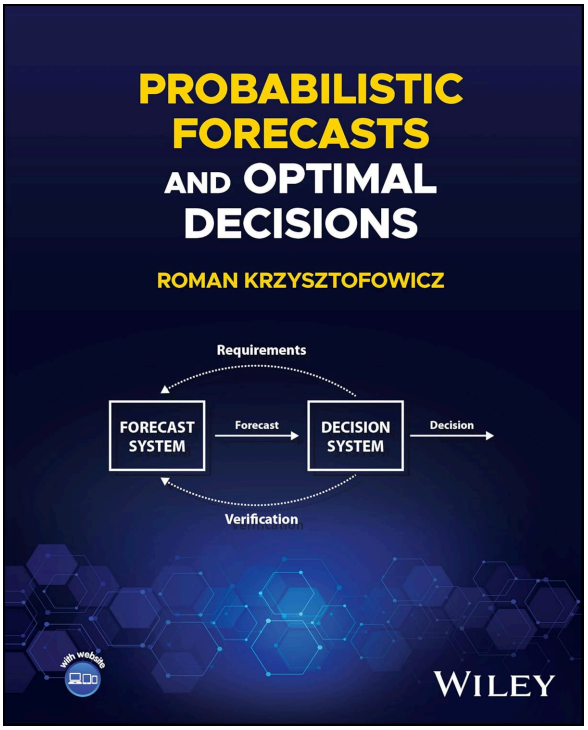
DFit™

Companion FaaS. Fitting as a Service™ that accompanies the book.



DFIT™ INTRODUCTION

BOOK CONTENTS

DFit™ Distribution Fitter: Introduction

This web-based software accompanies the book *Probabilistic Forecasts and Optimal Decisions* authored by Roman Krzysztofowicz and published by Wiley in 2025.

Developed originally in 2003 as an aid to research, DFit™ implements a methodology for modeling probability distributions of continuous variates. It is a logical-statistical-numerical methodology that aids the user to hypothesize,

estimate, evaluate, and choose a parametric distribution that best fits the data, which may come in either form:

- a random sample of realizations,
- a set of assessed quantiles.

This version of DFit™ offers 24 families of parametric distributions on 4 types of sample spaces. The allowable maximal (i) number of samples, (ii) sample size or number of quantiles, and (iii) number of fits depend on the license level (there are two).

The theory, procedures, and formulae (for the distribution functions, density functions, and quantile functions) are documented in the book, in:

Chapter 2. Basic Elements
Chapter 3. Distribution Modeling
Chapter 9. Judgmental Forecasting
Appendix B. Parameter Estimation Methods
Appendix C. Special Univariate Distributions

DFit™ is intended to be self-explanatory for a user who has the book and knows the above contents.

Notes on Numerical Procedures

1. **Scaling the data.**

The random sample of realizations, or the set of assessed quantiles, must consist of numbers whose absolute values are larger than 0.0001 and smaller than 1000. When this requirement is not satisfied, the numbers must be *rescaled*. Example: A distance measured in m has the realizations 98132, 74355, ... Changing the unit to km, and rescaling the realizations, yields 98.132, 74.355, ..., which are acceptable numbers.

2. **Specifying the sample space.**

When a bounded interval is specified, the initial bounds are displayed: eta L = smallest realization (or smallest quantile), eta U = largest realization (or largest quantile). These are merely aids to assessing the bounds via a logical analysis, as described in Section 3.3.2 of the book.

3. **Pruning away identical realizations.**

When there are 3 or more identical realizations (the ordinates) whose plotting positions (the abscissae) create a step in the empirical distribution function, only the *middle abscissa* (if their number is odd) or the *two middle abscissae* (if their number is even) are used in the estimation of parameters.

4. **Calculating maximum absolute difference, MAD.**

This is done using the *pruned empirical distribution function*. Thus, the MAD measures the goodness of fit of a given parametric distribution function relative to the best feasible fit ($\mathrm{MAD}=0$), which a continuous strictly increasing function passing through the midpoints of abscissae would offer. Consequently, when the steps created by abscissae of identical realizations are high, the MAD may be significantly smaller than the $\mathrm{K\text{-}S}$ statistic D, which is calculated using the *entire empirical distribution function*.

5. **Calculating critical value C for the $\mathrm{K\text{-}S}$ test.**

This C is taken from Table 3.2 in the book for sample sizes $\mathrm{N} = 2, 3, 4, 5$, and is calculated via a custom algorithm for any $\mathrm{N} > 5$. The calculated and the tabulated C may differ slightly. The reported significance level 0.00 means that the model is rejected at the significance level 0.01.

User Instructions

Creating an Account and Subscribing

Create an Account

First time user: choose the "sign up" option on the login page to register an account with F-D Systems. Instructor or Student: use your school email address. A strong password is recommended.

Choose a Subscription

The first time you login, before you can use DFit™, you will be prompted to select a subscription license. There are two levels:

	Academic License	Professional License
Description	Instructor or Student	Researcher or Analyst
Fee	$5 / 6 months	$19 / 6 months
Max Number of Samples	30	100
Max Sample Size	150	5,000
Max Number of Fits	900	3,000
Renewals	Instructor: unlimited Student: one-time	unlimited

Using DFit™

Go to "My Samples" and "Create New Sample and Specs"
In the box "Create Sample and Specs":

Sample data file	Upload the file containing your data: "CSV" file, without header, with one or two columns (see *Data type*)	
Name	Name your file	
Data type	Select type that is compatible with the data file:	
	"Random Sample"	one column (realization)
	"Assessed Quantiles"	two columns (quantile, corresponding probability)
Plotting positions	Select formula (only when "Random Sample"): "Meta-Gaussian" should be used for exercises and mini-projects	
Bounds on sample space	Specify the type of sample space Assess the bounds	
Hypothesized distributions	Select the distribution families (only those catalogued in Appendix C, or Gaussian from Chapter 2)	

Go to "Create"
Request "Statistics and Fit", or "Duplicate" the sample, or "Edit" the specs, or "Delete" the sample

"Perform Fit"	Estimates parameters and calculates MAD
"View Fits"	Displays a table with parameter estimates and MAD values The distributions can be ordered according to a column values
"Download Fits"	Downloads parameter estimates and MAD values

Limitation
One set of specs per sample. Thus, if after the fit you want to modify the specs and redo the fit, then you need to "Duplicate" the sample, "Edit" the specs, and select anew the hypothesized distribution families.

Probabilistic Forecasts and Optimal Decisions
By Roman Krzysztofowicz, Wiley 2025

Chapter Headings

About the Author

Roman Krzysztofowicz, PhD, is Professor of Systems Engineering in the School of Engineering and Applied Science and Professor of Statistics in the College and Graduate School of Arts and Sciences at the University of Virginia, Charlottesville, USA. He has previously held faculty posts at the University of Arizona and MIT, and his Bayesian Forecast — Decision Theory supplies a unified framework for the design and analysis of probabilistic forecast systems coupled with optimal decision systems.

DFIT™ INTRODUCTION

From Wiley Editor

Account for uncertainties and optimize decision-making with this thorough exposition

Decision theory is a body of thought and research seeking to apply a mathematical-logical framework to assessing probability and optimizing decision-making. It has developed robust tools for addressing all major challenges to decision making. Yet the number of variables and uncertainties affecting each decision outcome, many of them beyond the decider's control, mean that decision-making is far from a 'solved problem'. The tools created by decision theory remain to be refined and applied to decisions in which uncertainties are prominent.

Probabilistic Forecasts and Optimal Decisions introduces a theoretically-grounded methodology for optimizing decision-making under conditions of uncertainty. Beginning with an overview of the basic elements of probability theory and methods for modeling continuous variates, it proceeds to survey the mathematics of both continuous and discrete models, supporting each with key examples. The result is a crucial window into the complex but enormously rewarding world of decision theory.

Probabilistic Forecasts and Optimal Decisions readers will also find:

- Extended case studies supported with real-world data
- Mini-projects running through multiple chapters to illustrate different stages of the decision-making process
- End of chapter exercises designed to facilitate student learning

Probabilistic Forecasts and Optimal Decisions is ideal for advanced undergraduate and graduate students in the sciences and engineering, as well as predictive analytics and decision analytics professionals.

PURCHASE THE BOOK

Contact

The tools created by decision theory remain to be refined and applied to decisions in which uncertainties are prominent.

DFit ™ has been designed to help you model mathematically the uncertainties.

Contact Us at F-DSystems.com

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