

# David B. Stephenson's proposed classification scheme for forecasts

Table 1. The ten types of quantitative forecast. The predictand is the observable quantity that is to be predicted. The predictor is the forecast that is issued. Deterministic (non-probabilistic) forecasts just predict a single value of the predictand quantity whereas probabilistic forecasts predict the probability distribution for all possible values of the predictand. Some of the older literature used *categorical* to mean deterministic forecasts (of any type of predictand) but this can cause difficulties when trying to refer to probabilistic categorical forecasts.

Predictor	Predictand $X$	Acronym	Examples
Deterministic $\hat{X}$	Binary	DBF	Tornado or no Tornado (binary data)
	Categorical	DCF	Cold, normal or warm conditions (>2 categories)
	Integer	DIF	six hurricanes next season (count data)
	Real-valued	DRF	18C tomorrow (real-valued data)
	Complex	DCF	spatial rainfall forecast (complex data sets)
Probabilistic $\hat{p}(X)$	Binary	PBF	P=0.3 for tornado to occur
	Categorical	PCF	P=0.1,0.6,0.3 for cold/normal/warm conditions
	Integer	PIF	P(n)=Poisson distribution for hurricane counts
	Real-valued	PRF	P(x)=probability distribution for temperature
	Complex	PCF	P(x)=probability distribution for spatial maps

## Relationships between forecast types:

1. A DCF can be treated as a set of DBFs by considering each category separately as a binary event.
2. A DRF can be converted into an infinite sequence of DBFs by using exceedance of the predictor and predictand above a sequence of thresholds.
3. A PBF can be converted into an infinite sequence of DBFs by using a sequence of probability decision thresholds. A deterministic binary event is defined to occur when the forecast probability exceeds the threshold probability.
4. A PCF can be treated as a set of PBFs by considering each category separately as a binary event.
5. A PRF can be converted into an infinite sequence of PBFs by using a sequence of thresholds for the predictand.
6. Using relationships 5 and 3 it is possible to treat PRFs as a doubly-infinite set of DBFs that depend on a predictand threshold and a probability threshold.

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