Verification Refresher
Part I

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What makes a forecast good?

Forecasts should agree with observations, with few large errors	***Accuracy***
Forecast mean should agree with observed mean	***Bias***
Linear relationship between forecasts and observations	***Association***
Forecast should be more accurate than low-skilled reference forecasts (e.g., random chance, persistence, or climatology)	***Skill***

Adapted from : Ebert (2003)

What makes a forecast good?

Binned forecast values should agree with binned observations (agreement between categories)	***Reliability***
Forecast can discriminate between events & non-events	***Resolution***
Forecast can predict with strong probabilities (i.e., 100% for event, 0% for non-event)	***Sharpness***
Forecast represents the associated uncertainty	***Spread (Variability)***

Adapted from : Ebert (2003)

Standard scalar measures

- **Bias:**

  Forecast mean = observation mean

- **Correlation:**

  Variance shared between forecast and observed (r^2)

  Says nothing about bias

  or whether forecast variance = observed variance

- **Root Mean Squared Error**

  Distance between forecast and observation values

  Influenced by large errors for large events

- **Mean Absolute Error:**

  Alternative to RMSE

  Corresponds to CRPS for ensembles

Categorical Statistics

- Contingency table: used to analyze the relationship between 2 categorical variables in a single dataset
- 2x2 contingency table shows categories relative to a single threshold

		Event observed		
		Yes	***No***	***Total***
Event forecasted	***Yes***	**a**	**b**	**a+b**
	No	**c**	**d**	**c+d**
	Total	**a+c**	**b+d**	**a+b+c+d =n**

Hits: a

False Alarms: b

Misses: c

True negatives: d

Categorical Statistics

- Probability of Detection POD = a/(a+c)
- Discrimination - Conditional probability that given the event occurred, it was also forecast to occur
- How often were you not ‘surprised’?

		Event observed		
		Yes	***No***	***Total***
Event forecasted	***Yes***	**a**	**b**	**a+b**
	No	**c**	**d**	**c+d**
	Total	**a+c**	**b+d**	**n**

Hits: a

False Alarms: b

Misses: c

True negatives: d

Categorical Statistics

- Probability of False Detection POFD = b/(b+d)
- Discrimination - Conditional probability that given the event did not occur, it was forecast to occur
- False Alarm Rate

		Event observed		
		Yes	***No***	***Total***
Event forecasted	***Yes***	**a**	**b**	**a+b**
	No	**c**	**d**	**c+d**
	Total	**a+c**	**b+d**	**n**

Hits: a

False Alarms: b

Misses: c

True negatives: d

Categorical Statistics

- False Alarm Ratio FAR = b/(a+b)
- Reliability - Conditional probability that given the event was forecast to occur, the event did not occur
- How often were you led astray?

		Event observed		
		Yes	***No***	***Total***
Event forecasted	***Yes***	**a**	**b**	**a+b**
	No	**c**	**d**	**c+d**
	Total	**a+c**	**b+d**	**n**

Hits: a

False Alarms: b

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Questions?