Supplementary Materials

Supplementary Figures:

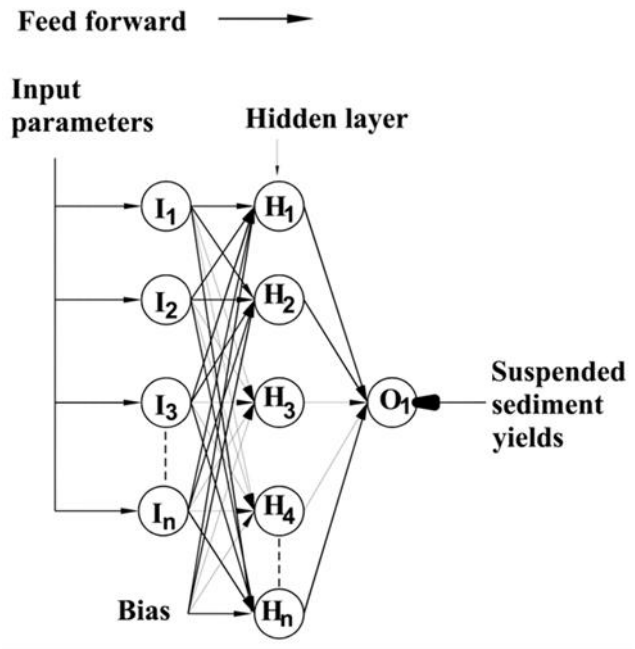

Figure S1. Schematic diagram of the ANN model for prediction of sediment yields with one hidden layer.

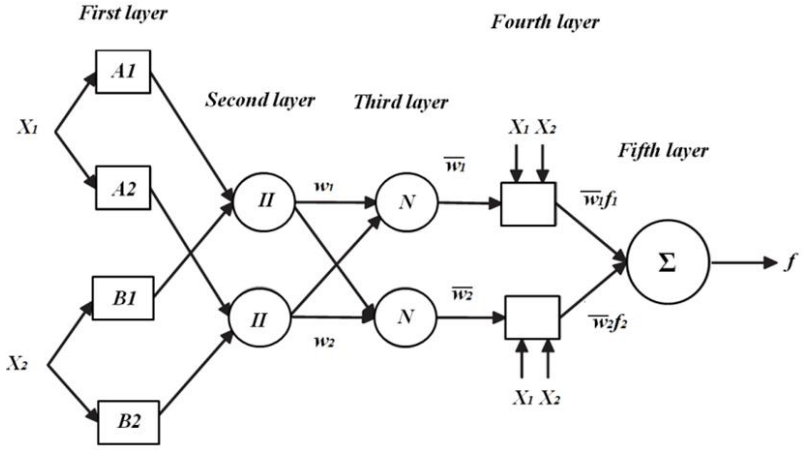

Figure S2. Schematic diagram of the ANFIS model for prediction of sediment yields with two inputs.

Supplementary Tables:

Table S1. Summary of the reviewed publications of data-based models sorted by year and input variables.

Serial #	Year	Authors	Input variables	Soft computing models
1	2001	Jain S.K [23]	Stage, Flows, Sediment	SRC, ANN
2	2006	Kerem et al. [24]	Flows, Sediment	SRC, ANN

3	2008	Cimen M. [33]	Flows, Sediment	ANN, SVM
4	2009	Rajaee et al. [25]	Flows, Sediment	SRC, ANN, ANFIS, MLR
5	2009	Cobaner et al. [29]	Flows, Sediment, Rainfall	SRC, ANN, ANFIS
6	2009	Kisi et al. [30]	Flows, Sediment	SRC, ANN, ANFIS
7	2010	Vali et al. [45]	Flows, Sediment	SRC, ANN, MARS
8	2011	Melesse et al. [26]	Flows, Sediment, Rainfall	ANN, MLR
9	2011	Rajaee T. [36]	Flows, Sediment	SRC, ANN, WANN
10	2012	Kisi et al. [31]	Flows, Sediment, Rainfall	ANN, ANFIS, GEP
11	2012	Senthil Kumar et al. [49]	Flows, Sediment, Rainfall	ANN, ANFIS, M5 tree
12	2013	Kakaei Lafdani et al. [35]	Flows, Sediment, Rainfall	ANN, SVM
13	2014	Goyal M.K [48]	Flows, Sediment, Rainfall	ANN, M5 tree, WR
14	2015	Kumar et al. [28]	Flows, Sediment, Rainfall	ANNs (LM, SCG, BR)
15	2015	Olyaie et al. [37]	Flows, Sediment	SRC, ANN, ANFIS, WANN
16	2015	Nourani et al. [38]	Flows, Sediment	ANN, WLSSVM, WANN
17	2016	Chachi et al. [46]	Flows	HMARS-FR, FLSR, FLAR
18	2017	Tsar et al. [27]	Flows, Sediment, Water Temperature	SRC, ANN, M5 tree, MLR
19	2017	Buyukyildiz et al. [34]	Flows, Sediment	ANN, SVM, ANFIS
20	2018	Emamgholizadeh et al. [32]	Flows, Sediment	ANN, ANFIS, GEP
21	2019	Adnan et al. [44]	Flows, Sediment	ANFIS-FCM, DENFIS, MARS

Table S2. Characteristics of the Gilgit River basin in the Upper Indus River.

River flow gauging station	**Gilgit at Gilgit**		
Longitude	74° 18′ 25″		
Latitude	35° 55′ 35″		
Altitude of stream gauging station	1454 m a.s.l		
Catchment drainage area	12095 km^2		
Glacier-covered area	1326.7891 km^2 (source GLIMS)		
Glacier cover percentage	10.01 %		
Mean elevation	3997 m a.s.l		
Area above 5000 m	10.1 %		
No. of meteorological stations having data for period 1981–2010	Observations monitored by Pakistan Meteorological Department (PMD)		
	Gilgit	Gupis	
	1460 m a.s.l	2156 m a.s.l	
No. of meteorological stations having data for period 1996–2010	Observations monitored by Water and Power Development Authority of Pakistan (WAPDA)		
	Ushkore	Yasin	Shendure
	3051 m a.s.l	3280 m a.s.l	3712 m a.s.l