J/MNRAS/427/1052 HTRU survey. Timing of 54 pulsars (Bates+, 2012)

The High Time Resolution Universe Pulsar Survey.
VI. An artificial neural network and timing of 75 pulsars.
Bates S.D., Bailes M., Barsdell B.R., Bhat N.D.R., Burgay M.,
Burke-Spolaor S., Champion D.J., Coster P., D'Amico N., Jameson A.,
Johnston S., Keith M.J., Kramer M., Levin L., Lyne A., Milia S., Ng C.,
Nietner C., Possenti A., Stappers B., Thornton D., Van Straten W.
<Mon. Not. R. Astron. Soc., 427, 1052-1065 (2012)>
=2012MNRAS.427.1052B (SIMBAD/NED BibCode)

ADC_Keywords: Surveys ; Pulsars

Keywords: methods: data analysis - stars: neutron - pulsars: general

Abstract:
We present 75 pulsars discovered in the mid-latitude portion of the High Time Resolution Universe survey, 54 of which have full timing solutions. All the pulsars have spin periods greater than 100ms, and none of those with timing solutions is in binaries. Two display particularly interesting behaviour; PSR J1054-5944 is found to be an intermittent pulsar, and PSR J1809-0119 has glitched twice since its discovery.
In the second half of the paper we discuss the development and application of an artificial neural network in the data-processing pipeline for the survey. We discuss the tests that were used to generate scores and find that our neural network was able to reject over 99per cent of the candidates produced in the data processing, and able to blindly detect 85per cent of pulsars. We suggest that improvements to the accuracy should be possible if further care is taken when training an artificial neural network; for example, ensuring that a representative sample of the pulsar population is used during the training process, or the use of different artificial neural networks for the detection of different types of pulsars.

Description:
All the pulsars presented here were discovered in the HTRU mid-latitude survey, which has now been fully processed. The survey observed the Galactic plane in the region -120°<l<30° and b≤15° (see Keith et al., 2010MNRAS.409..619K, for more details). After the discovery and subsequent confirmation observations with the Parkes 64-m radio telescope, pulsars with declinations δ>-35° were regularly observed using the 76-m Lovell Telescope and those below this declination were observed as part of the HTRU timing programme at Parkes.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table3.dat	113	54	Observable parameters for each of the pulsars with a full timing solution
table4.dat	51	54	Derived parameters for each of the pulsars with a full timing solution, based on the values in Table 3
tablea1.dat	61	725	Parameters and S/N ratios for detections of previously-known pulsars by the processing pipeline in the mid-latitude portion of the HTRU survey

See also:
J/MNRAS/423/1351 : Energy distribution in pulsars (Burke-Spolaor+, 2012)
J/MNRAS/450/2922 : HTRU survey new pulsars (Ng+, 2015)
http://www.atnf.csiro.au/research/pulsar/psrcat/ : ATNF Home Page

Byte-by-byte Description of file: table3.dat

Bytes	Format	Units	Label	Explanations
1- 10	A10	---	Pulsar	Pulsar name (JHHMM-DDMM)
12- 13	I2	h	RAh	Right ascension (J2000)
15- 16	I2	min	RAm	Right ascension (J2000)
18- 23	F6.3	s	RAs	Right ascension (J2000)
25- 29	F5.3	s	e_RAs	rms uncertainty on RA (1σ) (1)

31	A1	---	DE-	Declination sign (J2000)
32- 33	I2	deg	DEd	Declination (J2000)
35- 36	I2	arcmin	DEm	Declination (J2000)
38- 42	F5.2	arcsec	DEs	Declination (J2000)
44- 48	F5.2	arcsec	e_DEs	rms uncertainty on DE (1σ) (1)
50- 63	F14.12	s	Per	Period
65- 78	F14.12	s	e_Per	rms uncertainty on Per (1σ) (1)
80- 84	I5	d	Epoch	Period epoch (MJD)
86- 92	F7.4	10-15	dP/dt	Period derivative
94- 99	F6.4	10-15	e_dP/dt	rms uncertainty on dP/dt (1σ) (1)
102-107	F6.2	pc/cm3	DM	Dispersion measure
109-113	F5.2	pc/cm3	e_DM	rms uncertainty on DM (1σ) (1)

Note (1): errors as reported by TEMPO2.

Byte-by-byte Description of file: table4.dat

Bytes	Format	Units	Label	Explanations
1- 10	A10	---	Pulsar	Pulsare name (JHHMM-DDMM)
12- 16	F5.1	deg	GLON	Galactic longitude
18- 22	F5.1	deg	GLAT	Galactic latitude
24	A1	---	l_d	Limit flag on d
25- 29	F5.2	kpc	d	Distance (1)
31- 37	F7.2	Myr	tauc	Characteristic age
39- 43	F5.2	10+11gauss	Bsurf	Surface magnetic flux density
45- 51	F7.4	10+25W	dE/dt	Spin down energy loss rate (in 10^{32}erg/s)

Note (1): Estimates of the distance are based upon a Galactic electron density model by Cordes & Lazio (2002, preprint (arXiv:astro-ph/0207156)).

Byte-by-byte Description of file: tablea1.dat

Bytes	Format	Units	Label	Explanations
1- 11	A11	---	Pulsar	Pulsar Name (JHHMM+DDMM, JHHMM+DDMMA or JHHMM+DDMMm)
14- 21	F8.6	s	Per	Period
22	A1	---	n_Per	[*] Note on Per (1)
24- 30	F7.2	pc/cm+3	DM	Dispersion measure
31	A1	---	n_DM	[*] Note on DM (1)
33- 39	F7.2	mJy	S1400	?=- Radio flux at 1.4GHz (2)
41- 47	F7.3	deg	GLON	Galactic longitude (2)
49- 55	F7.3	deg	GLAT	Galactic latitude (2)
57- 61	F5.1	---	S/N	Signal-to-noise ratio

Note (1): * indicates that the pulsar was published with an incorrect period or DM. The corrected value is shown here.
Note (2): Galactic coordinates and radio fluxes (for an observing frequency of 1.4GHz) are taken from the pulsar catalogue, where possible.

History:
From electronic version of the journal

References:

Keith et al., Paper I 2010MNRAS.409..619K
Bates et al., Paper II 2011MNRAS.416.2455B
Burke-Spolaor et al., Paper III 2011MNRAS.416.2465B
Keith et al., Paper IV 2012MNRAS.419.1752K
Burke-Spolaor et al., Paper V 2012MNRAS.423.1351B, Cat. J/MNRAS/423/1351
Burgay et al., Paper VII 2013MNRAS.433..259B
Levin et al., Paper VIII 2013MNRAS.434.1387L
Tiburzi et al., Paper IX 2013MNRAS.436.3557T
Ng et al., Paper X 2014MNRAS.439.1865N
Bates et al., Paper XI 2015MNRAS.446.4019B
Ng et al., Paper XII 2015MNRAS.450.2922N, Cat. J/MNRAS/450/2922
Cameron et al. Paper XIII 2018MNRAS.475L..57C

(End) Patricia Vannier [CDS] 09-Nov-2018

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