Thesis submitted for the degree of
Honours

The Main Title of the Thesis

The Subtitle of the Thesis

Albert Einstein

October 2018

Supervisors:
Prof. Dr. John Doe
Prof. Dr. Jane Doe

Faculty of Sciences
School of Physical Sciences
Department of Physics
The University of Adelaide

Principal Superviso:	Prof. Dr. John Doe
Co-Supervisor:	Prof. Dr. Jane Doe
Date of Submission:	10th October 2018

Abstract

The abstract must not exceed 500 words.
It could be structured as follows: Motivation and aim of the thesis, methods, results.

Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

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Published works within this thesis:

S. Einecke (2016). "Search for High-Confidence Blazar Candidates and Their MWL Counterparts in the *Fermi*-LAT Catalog Using Machine Learning". In: *Galaxies* 4.3, p. 14

F. Temme et al. (2015). "FACT - First Energy Spectrum from a SiPM Cherenkov Telescope". In: *The 34th International Cosmic Ray Conference* (The Hague, The Netherlands). 707. Proceedings of Science

K. Eckle et al. (2017). "Multiscale Inference for a Multivariate Density with Applications to X-Ray Astronomy". In: *Annals of the Institue of Statistical Mathematics*

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Acknowledgment

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Contents

1 Introduction

Space is big. Really big.
You just won't believe how vastly, hugely, mind-bogglingly big it is.

— Douglas Adams, *The Hitchhiker's Guide to the Galaxy*

How big is big? Hundreds of thousands of years are already necessary for light to traverse our Galaxy, comprising hundreds of billions of stars. The Universe is even bigger with 2 trillion of similar galaxies accessible to our observations. The size of the observable universe has been determined by the Planck space mission to be 13.8 billion light years, deduced from the most precise map of the cosmic microwave background to date. This is already vastly big, but the Universe beyond the observable one is once again by a multitude bigger. Arthur Dent – the main character in *The Hitchhiker's Guide to the Galaxy* – must have felt rather lost in this mind-bogglingly big space.

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This thesis deals with ...

For these purposes, the thesis is structured as follows:

Chapter 2 gives an overview of ...

Chapter 3 explains ...

Chapter 4 describes ...

Chapter 5 presents ...

Chapter 6 illustrates ...

2 Astroparticle Physics at a Glance

All you really need to know for the moment
is that the Universe is a lot more complicated than you might think,
even if you start from a position of thinking it's pretty damn complicated in the first place.

— Douglas Adams, *The Hitchhiker's Guide to the Galaxy*

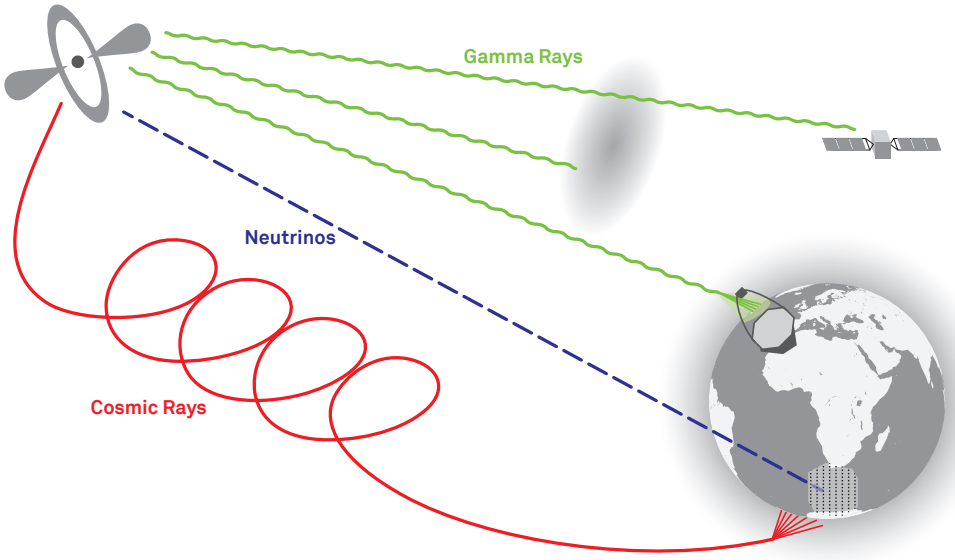

Figure 2.1: Astroparticle physics at a glance. Specific astronomical objects emit different messengers, such as neutrinos, cosmic and gamma rays, propagating through the universe. Depending on the type of messenger, they might interact with magnetic fields, interstellar clouds, the Earth's atmosphere or the Earth itself, and they can be detected with different instruments.

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3 Tipps

3.1 References

The use of `autoref` from the `hyperref` package is really useful. It automatically writes the type, e. g. Figure, section, subsection, of your reference. Like this, not only the number of your reference, but also the type is used for the link. Furthermore, no linebreaks between the type and the number will occur. To use it, just replace `\ref` by `\autoref`.
Here is an example to show the differences between the commands: 3.1 vs. section 3.1.
For the appendix, the use of `\autoref` will create the following:
Appendix B for the chapter, and section B.1 for the section. For sections, you might want to have it differently. Therefore, a specific command has been added in the preamble. Just use `\aref` instead of `\autoref`, and you will get the following:
Appendix B.1 for the section.

3.2 Citations

The adavantage of using the citationstyle author year (instead of numbers or abbreviations) is that a reader from your field will most probably know the corresponding publication and will not need to check the bibliography. Moreover, a name is easier to remember than just a number. Therefore, you will make it easier for the reader to read your thesis (and you want to make it as comfortable for your referee as possible).
In principle, there are two situations where you want to cite something: `\cite`: Einecke, 2016 suggests to use model XY. `\citep`: The model describes the formation of stars (Einecke, 2016).

3.3 Graphics

3.4 Tables

3.5 Structure of the Thesis

A Multi-Wavelength Analysis

A.1 Coordinates of Associated Sources

Table A.1: Coordinates of associated 3FGL sources.

3FGL Name	Associated Name	RA	Dec
3FGL J0001.2-0748	PMN J0001-0746	0.32512	-7.77417
3FGL J0001.4+2120	TXS 2358+209	0.38488	21.22674
3FGL J0002.2-4152	1RXS J000135.5-415519	0.39723	-41.91437
3FGL J0003.2-5246	RBS 0006	0.83158	-52.79081
3FGL J0003.8-1151	PMN J0004-1148	1.02048	-11.81622
3FGL J0004.7-4740	PKS 0002-478	1.14856	-47.60545
3FGL J0006.4+3825	S4 0003+38	1.48823	38.33754
3FGL J0008.0+4713	MG4 J000800+4712	1.99988	47.20217
3FGL J0008.6-2340	RBS 0016	2.1475	-23.65775
3FGL J0009.1+0630	CRATES J000903.95+062821.5	2.26646	6.47264
3FGL J0009.3+5030	NVSS J000922+503028	2.34388	50.50803
3FGL J0009.6-3211	IC 1531	2.39824	-32.27701
3FGL J0012.4+7040	TXS 0008+704	2.88293	70.75878
3FGL J0013.2-3954	PKS 0010-401	3.24962	-39.90724
3FGL J0013.9-1853	RBS 0030	3.48354	-18.9019
3FGL J0014.0-5025	RBS 0032	3.54675	-50.37572
3FGL J0014.6+6119	4C +60.01	3.7033	61.29543
3FGL J0014.7+5802	1RXS J001442.2+580201	3.67546	58.0337
3FGL J0015.7+5552	GB6 J0015+5551	3.91729	55.86242
3FGL J0016.3-0013	S3 0013-00	4.0462	-0.25346
3FGL J0017.2-0643	PMN J0017-0650	4.28908	-6.84264
3FGL J0017.6-0512	PMN J0017-0512	4.39924	-5.2116
3FGL J0018.4+2947	RBS 0042	4.61562	29.79178
3FGL J0018.9-8152	PMN J0019-8152	4.83596	-81.881
3FGL J0019.1-5645	PMN J0019-5641	4.86071	-56.69525
3FGL J0019.4+2021	PKS 0017+200	4.90773	20.36268
3FGL J0021.6-6835	PKS 0021-686	6.02792	-68.3485
3FGL J0021.6-2553	CRATES J002132.55-255049.3	5.38563	-25.84703
3FGL J0022.1-1855	1RXS J002209.2-185333	5.53862	-18.89303
3FGL J0022.1-5141	1RXS J002159.2-514028	5.50025	-51.67344
3FGL J0022.5+0608	PKS 0019+058	5.63517	6.13452
3FGL J0023.5+4454	B3 0020+446	5.89768	44.94327
3FGL J0024.4+0350	GB6 J0024+0349	6.188333	3.817639
3FGL J0026.7-4603	1RXS J002636.3-460101	6.64879	-46.01922
3FGL J0028.6+7507	GB6 J0028+7506	7.05479	75.10372
3FGL J0028.8+1951	TXS 0025+197	7.12424	20.00743
3FGL J0029.1-7045	PKS 0026-710	7.17312	-70.75447
3FGL J0030.2-1646	1RXS J003019.6-164723	7.58167	-16.78972
3FGL J0030.3-4223	PKS 0027-426	7.57327	-42.41278
3FGL J0030.7-0209	PKS B0027-024	7.6326	-2.19893
3FGL J0031.3+0724	NVSS J003119+072456	7.83217	7.41578
3FGL J0032.3-2852	PMN J0032-2849	8.13792	-28.82231
3FGL J0033.6-1921	KUV 00311-1938	8.3925	-19.35925
3FGL J0035.2+1513	RX J0035.2+1515	8.81135	15.25115
3FGL J0035.9+5949	1ES 0033+595	8.96935	59.83461
3FGL J0037.9+1239	NVSS J003750+123818	9.46187	12.63856
3FGL J0038.0-2501	PKS 0035-252	9.5614	-24.98395
3FGL J0038.0+0012	NVSS J003808+001336	9.53543	0.22682
3FGL J0039.0-2218	PMN J0039-2220	9.78421	-22.33372
3FGL J0039.1-0939	TXS 0036-099	9.77622	-9.71302
3FGL J0039.1+4330	NVSS J003907+433015	9.78296	43.50431
3FGL J0040.3+4049	B3 0037+405	10.0575	40.83464
3FGL J0040.5-2339	PMN J0040-2340	10.10379	-23.66689
3FGL J0041.9+3639	RX J0042.0+3641	10.535	36.6875
3FGL J0042.0+2318	PKS 0039+230	10.51894	23.33363
3FGL J0043.5-0444	1RXS J004333.7-044257	10.89217	-4.71681
3FGL J0043.7-1117	1RXS J004349.3-111612	10.95288	-11.26867
3FGL J0043.8+3425	GB6 J0043+3426	10.95353	34.44059

Table A.1: – continued from previous page

3FGL Name	Associated Name	RA	Dec
3FGL J0045.2-3704	PKS 0042-373	11.30025	-37.09667
3FGL J0045.3+2126	GB6 J0045+2127	11.33042	21.46114
3FGL J0045.7+1217	GB6 J0045+1217	11.43059	12.28661
3FGL J0046.7-8419	PKS 0044-84	11.11192	-84.37781
3FGL J0047.0+5658	GB6 J0047+5657	11.75179	56.96178
3FGL J0047.9+5447	1RXS J004754.5+544758	11.96608	54.79581
3FGL J0048.0+3950	B3 0045+395	11.98008	39.816
3FGL J0048.0+2236	NVSS J004802+223525	12.01092	22.59006
3FGL J0049.4-5401	PMN J0049-5402	12.45354	-54.04536
3FGL J0049.4-4149	1RXS J004939.9-415133	12.41625	-41.85917
3FGL J0049.7+0237	PKS 0047+023	12.43015	2.61772
3FGL J0049.8-5737	PKS 0047-579	12.4978	-57.64093
3FGL J0050.0-4458	PMN J0049-4457	12.31933	-44.95319
3FGL J0050.4-0449	PKS 0047-051	12.58973	-4.87239
3FGL J0050.6-0929	PKS 0048-09	12.67216	-9.48478
3FGL J0051.0-0649	PKS 0048-071	12.78421	-6.83395
3FGL J0051.2-6241	1RXS J005117.7-624154	12.81942	-62.70117
3FGL J0054.8-2455	FRBA J0054-2455	13.69471	-24.92486
3FGL J0055.2-1213	TXS 0052-125	13.79909	-12.29919
3FGL J0056.3-2116	PMN J0056-2117	14.1345	-21.28556
3FGL J0056.3-0935	TXS 0053-098	14.08367	-9.60831
3FGL J0057.9-0542	PKS 0055-059	14.52111	-5.66452
3FGL J0058.0-3233	PKS 0055-328	14.50929	-32.57243
3FGL J0058.3+3315	MG3 J005830+3311	14.63362	33.18812
3FGL J0059.1-5701	PKS 0056-572	14.69409	-56.98652
3FGL J0059.2-0152	1RXS J005916.3-015030	14.82054	-1.83822
3FGL J0059.6+0003	PKS 0056-00	14.77298	0.11434
3FGL J0100.2+0745	GB6 J0100+0745	15.08662	7.76428
3FGL J0102.3+4217	GB6 J0102+4214	15.61313	42.23861
3FGL J0102.8+5825	TXS 0059+581	15.69068	58.40309
3FGL J0103.4+5336	1RXS J010325.9+533721	15.85817	53.62036
3FGL J0103.7+1323	NVSS J010345+132346	15.94079	13.39614
3FGL J0105.1-2415	PKS 0102-245	16.24252	-24.27457
3FGL J0105.3+3928	GB6 J0105+3928	16.28833	39.47092
3FGL J0107.0-1208	PMN J0107-1211	16.79913	-12.18989
3FGL J0108.5-0035	PKS 0105-008	17.11184	-0.62338
3FGL J0108.7+0134	4C +01.02	17.16155	1.58342
3FGL J0109.1+1816	MG1 J010908+1816	17.28408	18.26875
3FGL J0109.8+6132	TXS 0106+612	17.4431	61.55846
3FGL J0109.9-4020	RBS 0158	17.48575	-40.34753
3FGL J0110.2+6806	4C +67.04	17.55364	68.09478
3FGL J0110.9-1254	1RXS J011050.0-125455	17.70838	-12.91769
3FGL J0111.5+0535	1RXS J011130.5+053612	17.87579	5.6075
3FGL J0112.1+2245	S2 0109+22	18.02427	22.74411
3FGL J0112.8+3207	4C +31.03	18.20972	32.13818
3FGL J0113.0-3554	PMN J0113-3551	18.31604	-35.86331
3FGL J0113.4+4948	S4 0110+49	18.36253	49.80668
3FGL J0114.8+1326	GB6 J0114+1325	18.71991	13.42708
3FGL J0115.7+0356	PMN J0115+0356	18.9188	3.9454
3FGL J0115.8+2519	RX J0115.7+2519	18.942375	25.3315
3FGL J0116.0-1134	PKS 0113-118	19.05217	-11.60429
3FGL J0116.2-2744	1RXS J011555.6-274428	18.98117	-27.74219
3FGL J0116.3-6153	SUMSS J011619-615343	19.08117	-61.8955
3FGL J0117.8-2113	PKS 0115-214	19.45325	-21.18518
3FGL J0118.8-2142	PKS 0116-219	19.73859	-21.69171
3FGL J0118.9-1457	1RXS J011905.4-145906	19.76925	-14.98292
3FGL J0120.4-2700	PKS 0118-272	20.13193	-27.02351
3FGL J0121.7+5154	NVSS J012133+515557	20.39025	51.93261
3FGL J0122.8+3423	1ES 0120+340	20.78599	34.34685
3FGL J0123.7-2312	1RXS J012338.2-231100	20.90996	-23.18292
3FGL J0125.2-0627	PMN J0124-0624	21.21033	-6.41719
3FGL J0125.4-2548	PKS 0122-260	21.32849	-25.81789
3FGL J0126.1-2227	PKS 0123-226	21.56251	-22.376
3FGL J0127.1-0818	PMN J0127-0821	21.81796	-8.35806
3FGL J0127.2+0325	NVSS J012713+032259	21.80805	3.38353
3FGL J0127.9+2551	4C +25.05	21.6783	25.98369
3FGL J0128.5+4430	GB6 J0128+4439	22.17224	44.655
3FGL J0130.8+1441	4C +14.06	22.48061	14.77995
3FGL J0131.2+6120	1RXS J013106.4+612035	22.78028	61.34267
3FGL J0131.3+5548	TXS 0128+554	22.80758	55.75364
3FGL J0132.5-0802	PKS 0130-083	23.17136	-8.06801
3FGL J0132.6-1655	PKS 0130-17	23.1812	-16.91348
3FGL J0133.0-4413	SUMSS J013306-441422	23.27679	-44.23958
3FGL J0133.2-5159	PKS 0131-522	23.27401	-52.0011
3FGL J0133.3+4324	B3 0129+431	23.18386	43.42574
3FGL J0134.3-3842	PMN J0134-3843	23.63346	-38.72594
3FGL J0134.5+2638	1RXS J013427.2+263846	23.61792	26.64583
3FGL J0135.0+6927	TXS 0130+691	23.66984	69.41969
3FGL J0136.5+3905	B3 0133+388	24.13542	39.09989
3FGL J0137.0+4752	OC 457	24.24414	47.85808
3FGL J0137.6-2430	PKS 0135-247	24.409853	-24.514971
3FGL J0137.8+5813	1RXS J013748.0+581422	24.46025	58.23644
3FGL J0139.9+8735	NVSS J013913+873754	24.80571	87.63186
3FGL J0141.4-0929	PKS 0139-09	25.35763	-9.4788
3FGL J0143.7-5845	SUMSS J014347-584550	25.94842	-58.76394

B MAGIC Analysis

B.1 Selected Data

3FGLJ2346.7+0705 Data

The following runs have been used for the MAGIC analysis of the source 3FGLJ2346.7+0705 and have been downloaded on superstar level:
05055339, 05055340, 05055436, 05055437, 05055438, 05055439, 05055440, 05055441, 05055471, 05055472, 05055473, 05055474, 05055475, 05055502, 05055503, 05055504, 05055505, 05055506, 05055507, 05055581, 05055582, 05055583, 05055584, 05055629, 05055630, 05055631, 05055632, 05055633, 05055634, 05055635, 05055659, 05055660, 05055670, 05055671, 05055672, 05055699, 05055700, 05057801, 05057802, 05057803, 05057804, 05057838, 05057840, 05057895, 05058673, 05058855, 05058856, 05058857, 05058859.

Additionally, the following subruns have been used for the MAGIC analysis of the source 3FGLJ2346.7+0705 and have been downloaded on star level:
M1: 05057839.001-.020, 05057892.001-.005, .008-.011, .013, .015-.020, .022-.025, 05057893.001-.003, .005-.007, .009-.012, .014-.025, 05057894.001-.011, .013-.025, 05058674.001-.009, 05058858.001-.011, .016-.021.
M2: 05057839.001-.020, 05057892.001-.005, .008-.011, .013-.020, .022-.025, 05057893.001-.003, .005-.007, .010, .012, .015-.025, 05057894.001-.011, .013-.025, 05058674.001-.009, 05058858.001-.010, .015-.020.

Crab Nebula Data

The following runs have been used for the sanity check of the MAGIC analysis of the source 3FGLJ2346.7+0705 and for the Random Forest study, and have been downloaded on superstar level:
05056516, 05056517, 05056587, 05056588, 05057065, 05057066, 05057067, 05057068, 05057069, 05057070, 05057144, 05057145, 05057146, 05057147, 05057148, 05057188, 05057189, 05057190, 05057191, 05057192, 05057649, 05057650, 05057651, 05057652, 05057653, 05057977, 05057978, 05058069, 05058072, 05058073, 05058074, 05058749, 05059266, 05059267, 05059268.

Additionally, the following subruns have been used for the sanity check of the MAGIC analysis of the source 3FGLJ2346.7+0705 and the Random Forest study, and have been downloaded on star level:
M1: 05057193.002-.004, 05059212.001-.012.
M2: 05057193.002-.004, 05059212.001-.012.

Data used as Hadrons

The following runs have been used for the training of the gamma / hadron separation for the MAGIC analysis of the source 3FGLJ2346.7+0705 and have been downloaded on superstar level:
1ES 0229+200: 05057396, 05057397, 05058048, 05058049, 05058461, 05058462, 05058923, 05058924, 05058925, 05058926.
M15: 05055321, 05055322, 05055323, 05055324, 05055624, 05055625, 05055626, 05056900, 05056901, 05056902, 05056903.
S3 0218+35: 05056153, 05056154, 05056155, 05056156, 05056617, 05056618, 05057172, 05057173.
Triangulum II: 05055980, 05055981, 05056416, 05056417, 05057051, 05057052, 05057865, 05057602, 05057603.

The following runs have been used for the Random Forest study and have been downloaded on superstar level:
1ES 0229+200: 05058048, 05058049, 05058461, 05058462, 05058925, 05058926.
M15: 05055321, 05055322, 05055625, 05055626, 05056900, 05056901.
S3 0218+35: 05056153, 05056154, 05056617, 05056618, 05057172, 05057173.
Triangulum II: 05056416, 05056417, 05057051, 05057052, 05057602, 05057603, 05057865.

B.2 Input Cards

coach.rc

```
RF.numTree:    100
RF.trainRatio: 0.95
RF.createTestSample: TRUE
RF.zdmin: 5.
RF.zdmax: 35.
RFLoop.FilterCuts.Continue0.Condition: MHillas_1.fSize<50.
RFLoop.FilterCuts.Continue1.Condition: MHillas_2.fSize<50.
RFLoop.FilterCuts.Continue2.Condition: MHillas_1.fSize>50000.
RFLoop.FilterCuts.Continue3.Condition: MHillas_2.fSize>50000.
RFLoop.FilterCuts.Continue4.Condition: MNewImagePar_1.fLeakage1>0.15
RFLoop.FilterCuts.Continue5.Condition: MNewImagePar_2.fLeakage1>0.15
RFLoop.FilterCuts.Continue6.Condition: MStereoPar.fValid<0.5

#####

RFLoop.GHCuts.Continue0.Condition: MImagePar_1.fNumIslands>1
RFLoop.GHCuts.Continue1.Condition: MImagePar_2.fNumIslands>1
RF.ReZenithing: TRUE
RF.numAzBins:   1
RF.numZdBins:   30
RF.NumTryGH: 3
RF.NdSizeGH: 5
RF.NumVariableGH: 12

RF.GHVariable1:  0.025+0.05*floor(log10(MHillas_1.fSize)/0.05)
RF.GHVariable2:  0.025+0.05*floor(log10(MHillas_2.fSize)/0.05)
RF.GHVariable3:  MHillas_1.fWidth
RF.GHVariable4:  MHillas_2.fWidth
RF.GHVariable5:  MHillas_1.fLength
RF.GHVariable6:  MHillas_2.fLength
RF.GHVariable7:  MStereoPar.fM1Impact
RF.GHVariable8:  MStereoPar.fM2Impact
RF.GHVariable9:  MStereoPar.fMaxHeight
RF.GHVariable10: sqrt(MHillasTimeFit_1.fP1Grad*MHillasTimeFit_1.fP1Grad)
RF.GHVariable11: sqrt(MHillasTimeFit_2.fP1Grad*MHillasTimeFit_2.fP1Grad)
RF.GHVariable12: (0.5/30.)+(1./30.)*floor(cos(MPointingPos_1.fZd*0.0174532925)/(1./30.))

#####

RFLoop.EnergyCuts.Continue0.Condition: MStereoPar.fCherenkovRadius<4000
RFLoop.EnergyCuts.Continue1.Condition: MStereoPar.fTheta2>0.1
RFLoop.EnergyCutsUnphys.Continue0.Condition: MStereoPar.fValid<1
RFLoop.EnergyCutsUnphys.Continue1.Condition: MStereoPar.fCherenkovDensity<0
MEnergyTable.SizeBinning 19
MEnergyTable.MinSize 25
MEnergyTable.MaxSize 200000
MEnergyTable.ImpactBinning 50
MEnergyTable.MinImpact 0
MEnergyTable.MaxImpact 3.5
MEnergyTable.ZdCorrectionFormula 0.97*pow(x,-0.3)/(1-pow(1-x,2.25))
```

```
MEnergyTable.LeakageCorrectionFormula_1 1-4*x*x
MEnergyTable.LeakageCut_1 0.2
MEnergyTable.LeakageCorrectionFormula_2 1-4*x*x
MEnergyTable.LeakageCut_2 0.2
MEnergyTable.BCorrectionFormula 0.93+0.2*sqrt(1.-pow(x,2))
MEnergyTable.MinEvtPerBin 3

########

RF.NumTryDisp: 3
RF.NdSizeDisp: 5
RF.NumVariableDisp: 11

RF.Disp1Variable1:  log10(MHillas_1.fSize)
RF.Disp1Variable2:  log10(MHillas_2.fSize)
RF.Disp1Variable3:  MStereoPar.fM1Impact
RF.Disp1Variable4:  MStereoPar.fM2Impact
RF.Disp1Variable5:  MPointingPos_1.fZd
RF.Disp1Variable6:  MStereoPar.fMaxHeight
RF.Disp1Variable7:  sqrt(MHillasTimeFit_1.fP1Grad*MHillasTimeFit_1.fP1Grad)
RF.Disp1Variable8:  sqrt(MHillasTimeFit_2.fP1Grad*MHillasTimeFit_2.fP1Grad)
RF.Disp1Variable9:  MHillas_1.fWidth
RF.Disp1Variable10: MHillas_1.fLength
# To be estimated in regression:
RF.Disp1Variable11: MHillasSrc_1.fDist*0.0033703

RF.Disp2Variable1:  log10(MHillas_1.fSize)
RF.Disp2Variable2:  log10(MHillas_2.fSize)
RF.Disp2Variable3:  MStereoPar.fM1Impact
RF.Disp2Variable4:  MStereoPar.fM2Impact
RF.Disp2Variable5:  MPointingPos_1.fZd
RF.Disp2Variable6:  MStereoPar.fMaxHeight
RF.Disp2Variable7:  sqrt(MHillasTimeFit_1.fP1Grad*MHillasTimeFit_1.fP1Grad)
RF.Disp2Variable8:  sqrt(MHillasTimeFit_2.fP1Grad*MHillasTimeFit_2.fP1Grad)
RF.Disp2Variable9:  MHillas_2.fWidth
RF.Disp2Variable10: MHillas_2.fLength
# To be estimated in regression:
RF.Disp2Variable11: MHillasSrc_2.fDist*0.0033703
```

Bibliography

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Einecke, S. (2016). "Search for High-Confidence Blazar Candidates and Their MWL Counterparts in the *Fermi*-LAT Catalog Using Machine Learning". In: *Galaxies* 4.3, p. 14.

Temme, F. et al. (2015). "FACT - First Energy Spectrum from a SiPM Cherenkov Telescope". In: *The 34th International Cosmic Ray Conference* (The Hague, The Netherlands). 707. Proceedings of Science.