Implication for developers of ML tools	Opportunities to build tools or more research	Paper	no of paper		Top theme from implication	No of paper discussing this challenges
Architecture of ML systems	Lack of tools	24,41,45	3		Lack of tools	9
Data Processing	Lack of tools	7	1		Governance or version control or provence tracking	5
Data Managment	Lack of tools	3	1		Prototype to production transition	4
Data validation	Lack of tools	12	1		Collabrative or multiorganisation ML workflow	4
Model Monitoring	Lack of tools	19,24	2		How data processing steps affects Model perform	2
Model drift	Lack of tools	17	1		ML testing , open problem	7
					ML monitoring , challenges	2
Datset creation	Governance or version control or provence tracking	15	1			
Data mangment	Governance or version control or provence tracking	4,13	2			
Model Goverance	Governance or version control or provence tracking	30,31	2			
Model deployment	Prototype to production transition	9,27	2			
Architecture of ML system	Prototype to production transition	38	1			
MLOps	Prototype to production transition	45	1			
Model monitoring	Collabrative or multiorganisation ML workflow	26	1			
Data Management	Collabrative or multiorganisation ML workflow	4	1			
ML system quality	Collabrative or multiorganisation ML workflow	51	1			
MLOps	Collabrative or multiorganisation ML workflow	54	1			
Implication for researcher	Opportunities to build tools or more research	Paper	no of paper			
Dataset creation or preprocessing	How data processing steps affects Model performance?	1	1			
Data preprocessing	How data processing steps affects Model performance?	5	1			
ML testing	ML testing , open problem	33,34,35,36,37,55,56	7			
ML monitoring	ML monitoring , challenges	19,24	2			