|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Work Task PLM Setting** | **Shape** | **Man** | **Auto** |  | **Shape Man** | **Auto** | **Tuning** | **Mul-Pr** |
| LMComm [173] CR L2R Zero | Clo | ✓ | - |  | Sp ✓ | - | TFP | - |
| GPT-2 [140] CR,QA GPT-2 Zero,Few | Clo,Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | PA |
| WNLaMPro [150] LCP BERT Zero | Clo | ✓ | - |  | Tok ✓ | - | TFP | - |
| LMDiagnose [39] CR,LCP BERT Zero | Clo | ✓ | - |  | Tok ✓ | - | TFP | - |
| AdvTrigger [177] GCG GPT-2 Full | Pre | - | Disc |  | Sen ✓ | - | TFP | - |
| CohRank [31] CKM BERT Zero | Clo | ✓ | - |  | Tok,Sp ✓ | - | TFP | - |
| LAMA [133] FP Conv,Trans Zero | Clo | ✓ | - |  | Tok ✓ | - | TFP | - |
| CTRL [75] GCG CTRL Full | Pre | ✓ | - |  | Sen ✓ | - | LMT | - |
| T5 [141] TC,SUM T5 Full | Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | LMT | - |
| Neg & Mis [74] FP Trans,ELMo Zero | Clo | ✓ | - |  | Tok ✓ | - | TFP | - |
| LPAQA [68] FP BERT,ERNIE Full | Clo | ✓ | Disc |  | Tok ✓ | - | TFP | PE |
| ZSC [135] TC GPT-2 Full | Pre | ✓ | - |  | Tok,Sp ✓ | - | LMT | - |
| PET-TC [153] TC RoBERTa,XLM-R Few | Pre | ✓ | - |  | Tok ✓ | Disc | LMT | PE |
| ContxFP [132] FP BERT,RoBERTa Zero | Clo | ✓ | Disc |  | Tok ✓ | - | TFP | - |
| UnifiedQA [76] QA T5,BART Full | Prefix | ✓ | - |  | Tok,Sp,Sen ✓ | - | LMT | - |
| RAG [95] QA,GCG,TC BART Full | Pre | - | Disc |  | Tok,Sp,Sen ✓ | - | LMPT | PE |
| QA,MT,GCG  GPT-3 [16] CR,TC,LCP GPT-3 Zero,Few  MR,SR,AR | Clo,Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | PA |
| CommS2S [187] CR T5 Full | Pre | ✓ | - |  | Tok ✓ | - | LMT | - |
| PET-SGLUE [154] TC ALBERT Few | Clo | ✓ | - |  | Tok,Sp ✓ | - | LMT | PE |
| ToxicityPrompts [47] GCG GPT-1,GPT-2 Zero | Pre | ✓ | - |  | N/A |  | TFP | - |
| WhyLM [147] Theory GPT-2 Full | Pre | ✓ | - |  | Tok ✓ | - | PT | - |
| X-FACTR [66] FP mBERT,BERT Zero | Clo | ✓ | - |  | Tok,Sp ✓ | - | TFP | - |
| Petal [149] TC RoBERTa Few | Clo | ✓ | - |  | Tok - | Disc | LMT | PE |
| AutoPrompt [159] TC,FP,IE BERT,RoBERTa Full | Clo | - | Disc |  | Tok - | Disc | TFP | - |
| CTRLsum [59] SUM BART Full | Pre | ✓ | - |  | Sen ✓ | - | LMT | - |
| PET-Gen [152] SUM PEGASUS Few | Pre | ✓ | - |  | Sen ✓ | - | LMT | PE |
| LM-BFF [46] TC RoBERTa Few | Clo | - | Disc |  | Tok - | Disc | LMT | PE,PA |
| WARP [55] TC RoBERTa Few,Full | Clo,Pre | ✓ | Cont |  | Tok ✓ | Cont | PT | PE |
| Prefix-Tuning [96] D2T,SUM GPT-2,BART Full | Pre | - | Cont |  | Sen ✓ | - | PT | - |
| KATE [100] TC,D2T,QA GPT-3 Few | Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | PA |
| PromptProg [145] MT,MR GPT-3 Zero,Few | Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | PA |
| ContxCalibrate [201] TC,FP,IE GPT-2,GPT-3 Few | Pre | ✓ | - |  | Tok,Sp ✓ | - | TFP | PA |
| PADA [8] TC,TAG T5 Full | Pre | - | Disc |  | N/A |  | LMPT | - |
| SD [155] GCG GPT-2 Zero | Pre | ✓ | - |  | N/A |  | TFP | - |
| BERTese [58] FP BERT Full | Clo | ✓ | Disc |  | Tok ✓ | - | TFP | - |
| Prompt2Data [148] TC RoBERTa Full | Clo | ✓ | - |  | Tok,Sp ✓ | - | LMT | - |
| P-Tuning [103] FP,TC GPT-2,BERT Few,Full | Clo,Pre | ✓ | Cont |  | Tok,Sp ✓ | - | TFP,LMPT | - |
| GLM [37] TC GLM Full | Clo | ✓ | - |  | Tok,Sp ✓ | - | LMT | - |

**Prompt Engineering Answer Engineering**

SUM,MT

ELMo,BERT

QA,MT

BERT

GPT-3,CTRL

XLM,XLM-R

AR,QA

ALBERT

Table 7: An organization of works on prompting (Part 1). See the caption of Tab. 8 for a detailed description for all the abbreviations used in this table.

**Prompt Engineering Answer Engineering**

RoBERTa

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Work Task PLM Setting** | **Shape** | **Man** | **Auto** |  | **Shape Man** | **Auto** | **Tuning** | **Mul-Pr** |
| ADAPET [170] TC ALBERT Few | Clo | ✓ | - |  | Tok,Sp ✓ | - | LMT | - |
| Meta [202] TC T5 Full | Pre | ✓ | - |  | Tok ✓ | - | LMT | - |
| OptiPrompt [203] FP BERT Full | Clo | ✓ | Cont |  | Tok ✓ | - | PT | - |
| Soft [137] FP BERT,BART Full | Clo | ✓ | Cont |  | Tok ✓ | - | PT | PE |
| DINO [151] GCG GPT-2 Zero | Pre | ✓ | - |  | N/A |  | TFP | - |
| AdaPrompt [21] IE BERT Few,Full | Clo | ✓ | - |  | Tok - | Disc | LMT | - |
| PMIDC [62] GCG,QA,TC GPT-2,GPT-3 Zero | Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | - |
| Prompt-Tuning [91] TC T5 Full | Pre | - | Cont |  | Tok,Sp ✓ | - | PT | PE |
| Natural-Instr [120] GCG GPT-3,BART Few,Full | Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP,LMT | PA |
| OrderEntropy [111] TC GPT-2,GPT-3 Few | Pre | ✓ | - |  | Tok ✓ | - | TFP | PA |
| FewshotSemp [158] SEMP GPT-3 Few | Pre | ✓ | - |  | Sen ✓ | - | TFP | PA |
| PanGu-*α* [194] QA,CR,TC PanGu-*α* Zero,Few | Clo,Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | PA |
| TrueFewshot [129] TC,FP GPT-2,GPT-3 Few | Clo,Pre | ✓ | Disc |  | Tok,Sp ✓ | - | TFP,LMT | - |
| PTR [56] IE RoBERTa Full | Clo | ✓ | Cont |  | Tok,Sp ✓ | - | LMPT | PC |
| TemplateNER [29] TAG BART Few,Full | Clo,Pre | ✓ | - |  | Tok ✓ | - | LMT | PD |
| PERO [83] TC,FP BERT,RoBERTa Few | Pre | ✓ | - |  | Tok ✓ | - | TFP | PA |
| PromptAnalysis [181] Theory BERT Full | Clo | - | Cont |  | N/A |  | PT | - |
| CPM-2 [198] QA,MR,SUM CPM-2 Full | Pre | - | Cont |  | Tok,Sp,Sent ✓ | - | PT,LMPT | - |
| BARTScore [193] EVALG BART Zero | Pre | ✓ | Disc |  | Sen ✓ | - | TFP | PE |
| NullPrompt [109] TC RoBERTa,ALBERT Few | Pre | ✓ | - |  | Tok ✓ | - | LMPT | - |
| Frozen [174] VQA,VFP,MG GPT-like Full | Pre | - | Cont |  | Sp (Visual) ✓ | - | PT | PA |
| TC,LCP,NLI  ERNIE-B3 [167] CR,QA,SUM ERNIE-B3 Zero | Clo,Pre | ✓ | - |  | Tok,Sp,Sen ✓ | - | TFP | - |

SUM,GCG

ALBERT

TC,GCG,MT

GCG

Codex [20] CodeGen GPT

HTLM [1] TC,SUM BART

Zero,Few Full

Zero,Few Full

Pre ✓ - Span ✓ Disc TFP,LMT PA Clo ✓ Disc Tok,Sp,Sen ✓ - LMT PA

FLEX [15] TC T5 Zero,Few Pre ✓ - Tok,Sp ✓ - LMT -

Table 8: An organization of works on prompting (Part 2). The **Task** column lists the tasks that are performed in corresponding papers. We use the following abbreviations. **CR**: Commonsense Reasoning. **QA**: Question Answering. **SUM**: Summarization. **MT**: Machine Translation. **LCP**: Linguistic Capacity Probing. **GCG**: General Conditional Generation. **CKM**: Commonsense Knowledge Mining. **FP**: Fact Probing. **TC**: Text Classification. **MR**: Mathematical Reasoning. **SR**: Symbolic Reasoning. **AR**: Analogical Reasoning. **Theory**: Theoretical Analysis. **IE**: Information Extraction. **D2T**: Data-to-text. **TAG**: Sequence Tagging. **SEMP**: Semantic Parsing. **EVALG**: Evaluation of Text Generation. **VQA**: Visual Question Answering. **VFP**: Visual Fact Probing. **MG**: Multimodal Grounding. **CodeGen**: Code generation. The **PLM** column lists all the pre-trained LMs that have been used in corresponding papers for downstream tasks. **GPT-like** is an autoregressive language model which makes small modifications to the original GPT-2 architecture. For other pre-trained LMs, please refer to §3 for more information. **Setting** column lists the settings for prompt-based learning, can be zero-shot learning (**Zero**), few-shot learning (**Few**), fully supervised learning (**Full**). Under **Prompt Engineering**, **Shape** denotes the shape of the template (**Clo** for cloze and **Pre** for prefix), **Man** denotes whether human effort is needed, **Auto** denotes data-driven search methods (**Disc** for discrete search, **Cont** for continuous search). Under **Answer Engineering**, **Shape** indicates the shape of the answer (**Tok** for token-level, **Sp** for span-level, **Sen** for sentence- or document-level), and **Man** and **Auto** are the same as above. The **Tuning** column lists tuning strategies (§7). **TFP**: Tuning-free Prompting. **LMT**: Fixed-prompt LM Tuning. **PT**: Fixed-LM Prompt Tuning. **LMPT**: LM+Prompt Tuning. The **Mul-Pr** column lists multi-prompt learning methods. **PA**: Prompt Augmentation. **PE**: Prompt Ensembling. **PC**: Prompt Composition. **PD**: Prompt Decomposition.

表 8：关于提示的工作组织（第 2 部分）。任务栏列出了在相应论文中执行的任务。我们使用以下缩写。 CR：常识推理。MT：机器翻译。 LCP：语言能力探测。 GCG：一般条件生成。 CKM：常识知识挖掘。 FP：事实调查。 TC：文本分类。MR：数学推理。 SR：符号推理。 AR：类比推理。IE：信息提取。 D2T：数据到文本。SEMP：语义解析。 EVALG：文本生成评估。 VQA：视觉问答。 VFP：视觉事实探测。 MG：多模式接地。 CodeGen：代码生成。 PLM 列列出了所有已在相应论文中用于下游任务的预训练 LM。 GPT-like 是一种自回归语言模型，它对原始 GPT-2 架构进行了小幅修改。对于其他预训练的 LM，请参阅第 3 节了解更多信息。设置栏列出了基于提示的学习的设置，可以是零样本学习（Zero）、少样本学习（Few）、完全监督学习（Full）。在 Prompt Engineering 下，Shape 表示模板的形状（Clo 表示完形填空，Pre 表示前缀），Man 表示是否需要人工，Auto 表示数据驱动的搜索方法（Disc 表示离散搜索，Cont 表示连续搜索）。在Answer Engineering下，Shape表示答案的形状（Tok表示token-level，Sp表示span-level，Sen表示sentence-或document-level），Man和Auto同上。调优列列出了调优策略（§7）。 TFP：免调优提示。 LMT：固定提示的 LM 调整。 PT：Fixed-LM Prompt Tuning。 LMPT：LM+提示调优。 Mul-Pr 列列出了多提示学习方法。 PA：提示增强。 PE：提示合奏。 PC：即兴作文。 PD：快速分解