

A Few-shot Pipeline Performance with Different Numbers of Actions and Shots

Table 1. Prediction Performance with Different Number of Actions and Shots. (Action Number 1–3)

Actions	Shots	Window-level				Action-level			
		Acc	Prec	Rec	F1	Acc	Prec	Rec	F1
1	1	0.614 \pm 0.006	0.700 \pm 0.007	0.614 \pm 0.006	0.571 \pm 0.008	0.768 \pm 0.007	0.810 \pm 0.007	0.768 \pm 0.007	0.748 \pm 0.009
	2	0.628 \pm 0.005	0.710 \pm 0.006	0.628 \pm 0.005	0.620 \pm 0.006	0.800 \pm 0.006	0.835 \pm 0.006	0.800 \pm 0.006	0.810 \pm 0.006
	3	0.658 \pm 0.005	0.736 \pm 0.005	0.658 \pm 0.005	0.634 \pm 0.006	0.832 \pm 0.006	0.860 \pm 0.005	0.832 \pm 0.006	0.825 \pm 0.006
	4	0.664 \pm 0.005	0.743 \pm 0.005	0.664 \pm 0.005	0.641 \pm 0.006	0.839 \pm 0.005	0.866 \pm 0.005	0.839 \pm 0.005	0.833 \pm 0.006
	5	0.670 \pm 0.005	0.746 \pm 0.005	0.670 \pm 0.005	0.648 \pm 0.006	0.847 \pm 0.005	0.871 \pm 0.005	0.847 \pm 0.005	0.842 \pm 0.006
	6	0.676 \pm 0.005	0.749 \pm 0.005	0.676 \pm 0.005	0.657 \pm 0.006	0.856 \pm 0.005	0.879 \pm 0.005	0.856 \pm 0.005	0.852 \pm 0.006
	7	0.685 \pm 0.005	0.755 \pm 0.005	0.685 \pm 0.005	0.667 \pm 0.006	0.864 \pm 0.005	0.883 \pm 0.005	0.864 \pm 0.005	0.860 \pm 0.006
	8	0.691 \pm 0.005	0.758 \pm 0.005	0.691 \pm 0.005	0.674 \pm 0.006	0.869 \pm 0.005	0.887 \pm 0.005	0.869 \pm 0.005	0.865 \pm 0.006
	9	0.696 \pm 0.005	0.760 \pm 0.005	0.696 \pm 0.005	0.680 \pm 0.006	0.870 \pm 0.005	0.885 \pm 0.005	0.870 \pm 0.005	0.865 \pm 0.006
	10	0.702 \pm 0.005	0.763 \pm 0.005	0.702 \pm 0.005	0.688 \pm 0.006	0.877 \pm 0.005	0.890 \pm 0.005	0.877 \pm 0.005	0.873 \pm 0.006
2	1	0.578 \pm 0.003	0.622 \pm 0.004	0.578 \pm 0.003	0.521 \pm 0.004	0.701 \pm 0.004	0.717 \pm 0.004	0.701 \pm 0.004	0.667 \pm 0.004
	2	0.589 \pm 0.003	0.635 \pm 0.004	0.589 \pm 0.003	0.545 \pm 0.004	0.745 \pm 0.004	0.760 \pm 0.004	0.745 \pm 0.004	0.730 \pm 0.004
	3	0.639 \pm 0.003	0.684 \pm 0.003	0.639 \pm 0.003	0.608 \pm 0.003	0.783 \pm 0.003	0.797 \pm 0.003	0.783 \pm 0.003	0.770 \pm 0.003
	4	0.653 \pm 0.003	0.696 \pm 0.003	0.653 \pm 0.003	0.625 \pm 0.003	0.803 \pm 0.003	0.815 \pm 0.003	0.803 \pm 0.003	0.792 \pm 0.003
	5	0.667 \pm 0.003	0.707 \pm 0.003	0.667 \pm 0.003	0.643 \pm 0.003	0.817 \pm 0.003	0.827 \pm 0.003	0.817 \pm 0.003	0.808 \pm 0.003
	6	0.679 \pm 0.003	0.717 \pm 0.003	0.679 \pm 0.003	0.659 \pm 0.003	0.829 \pm 0.003	0.838 \pm 0.003	0.829 \pm 0.003	0.821 \pm 0.003
	7	0.690 \pm 0.003	0.725 \pm 0.003	0.690 \pm 0.003	0.672 \pm 0.003	0.838 \pm 0.003	0.847 \pm 0.003	0.838 \pm 0.003	0.832 \pm 0.003
	8	0.699 \pm 0.003	0.731 \pm 0.003	0.699 \pm 0.003	0.682 \pm 0.003	0.847 \pm 0.003	0.854 \pm 0.003	0.847 \pm 0.003	0.841 \pm 0.003
	9	0.704 \pm 0.003	0.735 \pm 0.003	0.704 \pm 0.003	0.689 \pm 0.003	0.850 \pm 0.003	0.858 \pm 0.003	0.850 \pm 0.003	0.845 \pm 0.003
	10	0.708 \pm 0.003	0.738 \pm 0.003	0.708 \pm 0.003	0.695 \pm 0.003	0.854 \pm 0.003	0.862 \pm 0.003	0.854 \pm 0.003	0.849 \pm 0.003
3	1	0.566 \pm 0.002	0.572 \pm 0.003	0.566 \pm 0.002	0.511 \pm 0.003	0.670 \pm 0.003	0.667 \pm 0.004	0.670 \pm 0.003	0.636 \pm 0.003
	2	0.587 \pm 0.002	0.605 \pm 0.003	0.587 \pm 0.002	0.555 \pm 0.003	0.723 \pm 0.003	0.730 \pm 0.003	0.723 \pm 0.003	0.710 \pm 0.003
	3	0.630 \pm 0.002	0.654 \pm 0.003	0.630 \pm 0.002	0.596 \pm 0.003	0.758 \pm 0.002	0.766 \pm 0.003	0.758 \pm 0.002	0.742 \pm 0.003
	4	0.647 \pm 0.002	0.671 \pm 0.003	0.647 \pm 0.002	0.617 \pm 0.003	0.777 \pm 0.002	0.785 \pm 0.003	0.777 \pm 0.002	0.764 \pm 0.003
	5	0.660 \pm 0.002	0.683 \pm 0.002	0.660 \pm 0.002	0.635 \pm 0.003	0.791 \pm 0.002	0.799 \pm 0.003	0.791 \pm 0.002	0.781 \pm 0.003
	6	0.673 \pm 0.002	0.694 \pm 0.002	0.673 \pm 0.002	0.650 \pm 0.003	0.804 \pm 0.002	0.812 \pm 0.002	0.804 \pm 0.002	0.795 \pm 0.003
	7	0.682 \pm 0.002	0.701 \pm 0.002	0.682 \pm 0.002	0.662 \pm 0.003	0.811 \pm 0.002	0.819 \pm 0.002	0.811 \pm 0.002	0.803 \pm 0.002
	8	0.690 \pm 0.002	0.709 \pm 0.002	0.690 \pm 0.002	0.672 \pm 0.003	0.817 \pm 0.002	0.826 \pm 0.002	0.817 \pm 0.002	0.811 \pm 0.002
	9	0.697 \pm 0.002	0.714 \pm 0.002	0.697 \pm 0.002	0.680 \pm 0.003	0.823 \pm 0.002	0.831 \pm 0.002	0.823 \pm 0.002	0.818 \pm 0.002
	10	0.701 \pm 0.002	0.718 \pm 0.002	0.701 \pm 0.002	0.686 \pm 0.003	0.826 \pm 0.002	0.835 \pm 0.002	0.826 \pm 0.002	0.822 \pm 0.002

Table 2. Prediction Performance with Different Number of Actions and Shots. (Action Number 4–6)

Actions	Shots	Window-level				Action-level			
		Acc	Prec	Rec	F1	Acc	Prec	Rec	F1
4	1	0.557 \pm 0.002	0.553 \pm 0.003	0.557 \pm 0.002	0.501 \pm 0.003	0.659 \pm 0.003	0.656 \pm 0.003	0.659 \pm 0.003	0.627 \pm 0.003
	2	0.589 \pm 0.002	0.608 \pm 0.003	0.589 \pm 0.002	0.555 \pm 0.003	0.723 \pm 0.003	0.730 \pm 0.003	0.723 \pm 0.003	0.710 \pm 0.003
	3	0.619 \pm 0.002	0.635 \pm 0.003	0.619 \pm 0.002	0.583 \pm 0.003	0.739 \pm 0.003	0.745 \pm 0.003	0.739 \pm 0.003	0.723 \pm 0.003
	4	0.635 \pm 0.002	0.651 \pm 0.003	0.635 \pm 0.002	0.604 \pm 0.003	0.757 \pm 0.003	0.766 \pm 0.003	0.757 \pm 0.003	0.745 \pm 0.003
	5	0.647 \pm 0.002	0.663 \pm 0.003	0.647 \pm 0.002	0.621 \pm 0.003	0.770 \pm 0.002	0.778 \pm 0.003	0.770 \pm 0.002	0.761 \pm 0.003
	6	0.658 \pm 0.002	0.673 \pm 0.003	0.658 \pm 0.002	0.635 \pm 0.003	0.782 \pm 0.002	0.791 \pm 0.002	0.782 \pm 0.002	0.775 \pm 0.003
	7	0.667 \pm 0.002	0.681 \pm 0.003	0.667 \pm 0.002	0.646 \pm 0.003	0.790 \pm 0.002	0.799 \pm 0.002	0.790 \pm 0.002	0.783 \pm 0.002
	8	0.676 \pm 0.002	0.689 \pm 0.003	0.676 \pm 0.002	0.657 \pm 0.003	0.796 \pm 0.002	0.805 \pm 0.002	0.796 \pm 0.002	0.791 \pm 0.002
	9	0.684 \pm 0.002	0.697 \pm 0.003	0.684 \pm 0.002	0.667 \pm 0.003	0.803 \pm 0.002	0.814 \pm 0.002	0.803 \pm 0.002	0.800 \pm 0.002
	10	0.689 \pm 0.002	0.701 \pm 0.003	0.689 \pm 0.002	0.673 \pm 0.003	0.807 \pm 0.002	0.817 \pm 0.002	0.807 \pm 0.002	0.803 \pm 0.002
5	1	0.542 \pm 0.003	0.524 \pm 0.004	0.542 \pm 0.003	0.481 \pm 0.004	0.636 \pm 0.004	0.618 \pm 0.005	0.636 \pm 0.004	0.600 \pm 0.005
	2	0.584 \pm 0.003	0.581 \pm 0.004	0.584 \pm 0.003	0.538 \pm 0.004	0.691 \pm 0.004	0.689 \pm 0.004	0.691 \pm 0.004	0.668 \pm 0.004
	3	0.610 \pm 0.003	0.612 \pm 0.004	0.610 \pm 0.003	0.573 \pm 0.004	0.722 \pm 0.004	0.724 \pm 0.004	0.722 \pm 0.004	0.705 \pm 0.004
	4	0.629 \pm 0.004	0.635 \pm 0.004	0.629 \pm 0.004	0.597 \pm 0.004	0.741 \pm 0.004	0.746 \pm 0.004	0.741 \pm 0.004	0.728 \pm 0.004
	5	0.643 \pm 0.004	0.649 \pm 0.004	0.643 \pm 0.004	0.614 \pm 0.004	0.755 \pm 0.004	0.762 \pm 0.004	0.755 \pm 0.004	0.745 \pm 0.004
	6	0.654 \pm 0.004	0.661 \pm 0.004	0.654 \pm 0.004	0.629 \pm 0.004	0.767 \pm 0.004	0.774 \pm 0.004	0.767 \pm 0.004	0.759 \pm 0.004
	7	0.663 \pm 0.004	0.670 \pm 0.004	0.663 \pm 0.004	0.640 \pm 0.004	0.774 \pm 0.004	0.782 \pm 0.004	0.774 \pm 0.004	0.768 \pm 0.004
	8	0.672 \pm 0.004	0.679 \pm 0.004	0.672 \pm 0.004	0.651 \pm 0.004	0.785 \pm 0.004	0.793 \pm 0.004	0.785 \pm 0.004	0.779 \pm 0.004
	9	0.678 \pm 0.004	0.685 \pm 0.004	0.678 \pm 0.004	0.659 \pm 0.004	0.789 \pm 0.004	0.798 \pm 0.004	0.789 \pm 0.004	0.784 \pm 0.004
	10	0.684 \pm 0.004	0.690 \pm 0.004	0.684 \pm 0.004	0.666 \pm 0.004	0.795 \pm 0.004	0.803 \pm 0.004	0.795 \pm 0.004	0.790 \pm 0.004
6	1	0.533 \pm 0.009	0.510 \pm 0.010	0.533 \pm 0.009	0.479 \pm 0.010	0.617 \pm 0.010	0.613 \pm 0.011	0.617 \pm 0.010	0.589 \pm 0.011
	2	0.579 \pm 0.008	0.565 \pm 0.010	0.579 \pm 0.008	0.533 \pm 0.010	0.672 \pm 0.009	0.668 \pm 0.011	0.672 \pm 0.009	0.650 \pm 0.010
	3	0.599 \pm 0.009	0.592 \pm 0.010	0.599 \pm 0.009	0.561 \pm 0.010	0.703 \pm 0.010	0.706 \pm 0.011	0.703 \pm 0.010	0.686 \pm 0.011
	4	0.617 \pm 0.009	0.612 \pm 0.011	0.617 \pm 0.009	0.583 \pm 0.011	0.720 \pm 0.010	0.724 \pm 0.011	0.720 \pm 0.010	0.707 \pm 0.011
	5	0.630 \pm 0.009	0.628 \pm 0.011	0.630 \pm 0.009	0.601 \pm 0.010	0.734 \pm 0.009	0.739 \pm 0.011	0.734 \pm 0.009	0.723 \pm 0.010
	6	0.643 \pm 0.009	0.641 \pm 0.010	0.643 \pm 0.009	0.617 \pm 0.010	0.745 \pm 0.009	0.751 \pm 0.010	0.745 \pm 0.009	0.737 \pm 0.010
	7	0.650 \pm 0.009	0.649 \pm 0.010	0.650 \pm 0.009	0.625 \pm 0.010	0.756 \pm 0.009	0.764 \pm 0.010	0.756 \pm 0.009	0.749 \pm 0.009
	8	0.659 \pm 0.009	0.659 \pm 0.010	0.659 \pm 0.009	0.636 \pm 0.010	0.766 \pm 0.009	0.773 \pm 0.010	0.766 \pm 0.009	0.760 \pm 0.009
	9	0.666 \pm 0.009	0.666 \pm 0.010	0.666 \pm 0.009	0.645 \pm 0.010	0.772 \pm 0.009	0.783 \pm 0.009	0.772 \pm 0.009	0.767 \pm 0.010
	10	0.673 \pm 0.009	0.673 \pm 0.010	0.673 \pm 0.009	0.653 \pm 0.010	0.776 \pm 0.009	0.785 \pm 0.010	0.776 \pm 0.009	0.771 \pm 0.010

B Comparative Evaluation and Ablation of Pipeline Stages (10shots)

Table 3. Action-Level Results of Comparison Study and Ablation Study. The same training (10 shots, one new target behavior) and testing data were used to ensure consistency.

Methods	Acc	Prec	Rec	F1
SVM	0.809±0.006	0.864±0.004	0.809±0.006	0.778±0.008
Random Forest	0.779±0.006	0.832±0.006	0.779±0.006	0.738±0.008
COVID-away	0.740±0.005	0.812±0.004	0.740±0.005	0.698±0.006
Itchtector	0.745±0.006	0.808±0.006	0.745±0.006	0.696±0.008
HandGesCus	0.820±0.005	0.847±0.005	0.820±0.005	0.811±0.005

SVM (data augmentation & synthesis)	0.714±0.005	0.783±0.007	0.714±0.005	0.653±0.008
Random Forest (data augmentation & synthesis)	0.786±0.006	0.830±0.006	0.786±0.006	0.751±0.008
Itchtector (data augmentation & synthesis)	0.754±0.007	0.785±0.009	0.754±0.007	0.702±0.009

WatchGuardian w/o all	0.800±0.005	0.839±0.005	0.800±0.005	0.785±0.006
WatchGuardian with Stage 1 (pre-trained SSL model)	0.839±0.004	0.864±0.004	0.839±0.004	0.830±0.005
WatchGuardian with Stage 1 & 2 (finetuning)	0.841±0.004	0.872±0.004	0.841±0.004	0.829±0.005

WatchGuardian with Stage 1, 2, & 3 (data augmentation & synthesis)	0.877±0.005	0.890±0.005	0.877±0.005	0.873±0.006